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VOLUME 39—January-June, 1949

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(OVER)

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FIFTEEN YEARS LATER: A REPLICATION OF
"A SEMANTIC STUDY OF CONCEPTS OF
CLINICAL PSYCHOLOGISTS AND
PSYCHIATRISTS"*

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GEORGE SISKIND

A. INTRODUCTION

For the reader's convenience, an overview of the original study (2), published in 1950, is given by some quotations from the Summary and Conclusions of the original article.

Word definitions returned by twenty psychologists and seventeen psychiatrists, and the definitions of these same words appearing in six authoritative sources were studied.

The definitions of the first 20 words on the list were analyzed in terms of (1) the number of words used in the definition; and (2) the conceptualized response categories into which the definitions fell.

The most striking finding of the study is the looseness and ambiguity of the definition of many of these terms (2, pp. 228-229).¹

The terms used in the study are as follows:

Abstract	Bizarre	Defense	Father Figure
Affective	Bright Normal	Dependent	Hostility
Aggression	Compulsive	Depressive	Identification
Ambivalence	Constriction	Ego	Immaturity
Anxiety	Control	Emotional	Impulsive

The author's interest in this study is based on "the conceptualized response categories into which the definitions fell," because this indicates the degree to which the respondents agree as to definition of the term. There are three relevant questions in relation to the amount of agreement: (a) has there been a change in the "looseness and ambiguity" during the last 15 years, (b) what are the actual percentages of agreement in the original study and the replication, and (c) does the "looseness and ambiguity of the definitions" have an

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¹ Quotations from the original study (2) are used by permission of The American Psychological Association and the senior author.

effect on the studies which use reports containing these or similar terms as raw data?

B. PROCEDURE

A mailing was made to psychiatrists and psychologists in the Indianapolis area, using the directions as given in the original study. Definitions were obtained from 20 psychologists and 17 psychiatrists. There was no selection of the lists of definitions after they were returned. As they were returned, they were included in the proper group, psychologist or psychiatrist. After the necessary numbers (20 and 17) had been returned, none of the later lists was considered.

Using the categories given in the original article the definitions were classified. An example of the categories used follows:

Aggression

1. Hostile, destructive drive or behavior.
2. Positive assertion, active, forceful, dominant.
3. Unclassified (2, p. 220).

They were first classified by the author's departmental Research Associate,² then by the author. Disagreements as to classification were resolved by the judgment of a third member of the psychology department. In addition, the number of words in each response was counted.

For each term, a percentage of agreement was computed in the following way: the single category with the largest number of definitions in it was converted into a percentage of the total number of definitions given for the term. From the data of the 1950 study, a percentage of agreement was computed for each term.

The percentages of agreement for the original study and the replication were analyzed through use of the Median Test (3) by first comparing the percentages of agreement of the psychologists of the original study to those of the replication. A second comparison was made between the percentages of agreement achieved by the combination of psychologists and psychiatrists of the original study with those of the replication.

C. RESULTS

Word counts of each of the definitions given indicated that the psychologists of the replication gave longer definitions than did the psychiatrists, as did the psychologists in the original study.

² Mrs. Ann K. Drake.

The comparison of the percentages of agreement between the two groups of psychologists, original and replication, resulted in a X^2 of 1.6 with $p < .30$ ($1.64 = .20$). The comparison, original and replication, of the percentages of agreement combined for psychologists and psychiatrists resulted in a X^2 of zero.

While the Median Test allows comparison of the distribution of the percentages of agreement for similarity or difference, it does not show the actual percentages of agreement or the distribution. Without the actual percentages of agreement, one cannot evaluate the amount of agreement that does exist. The necessary information is given in Table 1.

D. CONCLUSIONS

The results of the Median Test permit the conclusion that the percentages of agreement of the original study and of the replication are substantially the same. The use of the 20 words for the past 15 years has not resulted in decreased ambiguity.

The distribution of the percentages of agreement and the Mean percentages of agreement (51 per cent, 57 per cent, 46 per cent, 51 per cent) for all of the words indicate that the statement of the original study, "... only rarely do as many as 75 per cent of the responses fall into a single category" (2, p. 229), is very much an understatement of the original and the present data. The Mean percentages of agreement more clearly depict the state of affairs. With Mean percentages of agreement ranging between 46 per cent and 57 per cent, these words become suspect as sources of difficulty in intra- and interprofessional communication.

The function of such words in psychological reports becomes a very relevant question for investigation. An example of a study in which the ambiguity of terms could have substantially influenced the findings is that by Goldfarb (1). In a study asking for clinical judgments as to proper diagnostic category, the judgments being based on psychological reports, he found agreement among judges to average less than 60 per cent. This is consistent with the data of the original and replication studies. It strongly suggests that the percentage of agreement of judgments based on psychological reports is limited by the ambiguity of the terms in the psychological report. It further suggests that, before attempting to investigate clinical judgment in this area, careful definition of terms is necessary.

Reexamination of the data of the original study and the data of replication indicates a necessity for more careful definition of frequently used terms in order to avoid the difficulties that result from the present degree of ambiguity.

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AMBIVALENCE IN SITUATIONS OF NEGATIVE INTERPERSONAL ATTITUDES*¹

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PETER E. ALIMARAS

A. INTRODUCTION

In a recent article by Price, Harburg, and Newcomb (5), it was pointed out that the consistency hypothesis proposed by the contemporary versions of balance theory [see Brown (1), Heider (2), and Newcomb (3)] involves additional parameters when, in a *POQ* triad, *P*-to-*O* is negative. (A *POQ* triad defines an interpersonal situation in which one person, *P*, has attitudinal relationships toward two other persons, *O* and *Q*, and perceives that *O* has a certain attitude toward *Q*.) These investigators had *Ss* complete triads indicating various situations between themselves and known people they liked and disliked. Four situations were balanced and four imbalanced. *Ss* were also asked to rate how each situation made them feel. Their responses were categorized in terms of "uneasy," "neutral," and "pleasant" for each situation. The results showed that when a situation had as a constituent element a positive *P*-to-*O* relationship—i.e., the subject liking another person—the affect responses were as predicted by balance theory for both the balanced and imbalanced situations. Here "neutral" responses were minimal, with "pleasant" responses predominating for the balanced situations and "uneasy" responses predominating for the imbalanced situations. However, when a situation had as a constituent element a negative *P*-to-*O* relationship—i.e., the subject disliking another person—the affect responses were less predictable. Here "neutral" responses were greater in number, "pleasant" responses did not differ from "uneasy" responses in the two balanced situations, and "pleasant" responses exceeded "uneasy" responses in one of the imbalanced situations. The parameters proposed by the investigators to account for this asymmetry between positive and negative *P*-to-*O* situations include uncertainty regarding reciprocated attitudes, attitude ambivalence, and engagement in the triadic system; these parameters operate differently in positive and negative situations.

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¹ Special gratitude is expressed to Milton Horowitz and Dana Bramel for their suggestions.

The present paper reports the results of a study that offers support for one of the parameters proposed by the above investigators—namely, attitude ambivalence—and for the suggestion of Price *et al.* that more attitudinal ambivalence exists with regard to disliked persons than liked persons.

B. METHOD

Ss, who were 38 male and female students of an introductory psychology course at the State University of New York at Stony Brook, were asked to write short descriptions of persons they knew. One half ($N = 21$) was told to write about a liked person and the other ($N = 17$) a disliked person. In both cases the described person could be either male or female. Ss were then asked to rate the described individual using an adjective rating list consisting of 20 bipolar adjective pairs, each pair separated by a 7-point semantic differential scale (4). The adjective pairs were *happy-sad*, *handsome-ugly*, *clean-dirty*, *honest-dishonest*, *valuable-worthless*, *good-bad*, *pleasant-unpleasant*, *fair-unfair*, *healthy-sick*, *harmonious-dissonant*, *successful-unsuccessful*, *true-false*, *positive-negative*, *reputable-disreputable*, *wise-foolish*, *sweet-sour*, *modest-conceited*, *nice-awful*, *optimistic-pessimistic*, and *warm-cold*.

C. RESULTS AND DISCUSSION

Ss' responses on the adjective rating list were categorized in terms of positive (scores of 1, 2, or 3), neutral (score of 4), and negative (score of 5, 6 or 7). The percentage of responses falling into these categories for all Ss is presented in Table 1. It was hypothesized that more attitudinal ambivalence will exist in situations of negative interpersonal relations than in those of positive interpersonal relations. As can be seen from Table 1, this hypothesis is supported. Ratings of liked persons on all adjective pairs were predominately positive with a minimum of neutral and negative responses ($p < .001$). Ratings of disliked persons, however, showed the predicted ambivalence, since responses to most of the adjective pairs were not predominately negative. This was especially true for the following pairs in which expected frequencies were met in all three categories ($p > .05$): *happy-sad*, *valuable-worthless*, *good-bad*, *successful-unsuccessful*, *reputable-disreputable*, *optimistic-pessimistic*, and *warm-cold*. Ambivalence can also be seen in the responses to the following adjective pairs, which did not meet the expected frequencies in each category but exhibited a tendency toward this ($.05 > p > .001$): *handsome-ugly*, *honest-dishonest*, *pleasant-unpleasant*, *healthy-sick*, *harmonious-dissonant*, *true-false*, *positive-negative*, *wise-foolish*, *sweet-sour*, and *nice-awful*. It will be noted that, for the pairs *handsome-ugly* and

TABLE 1
PERCENTAGE OF SUBJECTS RESPONDING TO LIKED AND DISLIKED PERSONS
ON 20 PAIRS OF TRAITS^a

Trait-pair	Direction of response			χ^2
	Positive	Neutral	Negative	
Happy-Sad	95	5	0	36.29***
	35	24	41	.82
Handsome-Ugly	90	10	0	31.14***
	65	0	35	10.70**
Clean-Dirty	100	0	0	42.00***
	76	0	24	15.64***
Honest-Dishonest	100	0	0	42.00***
	41	6	53	6.11*
Valuable-Worthless	95	5	0	36.29***
	18	29	53	3.29
Good-Bad	95	5	0	36.29***
	18	35	47	2.23
Pleasant-Unpleasant	100	0	0	42.00***
	29	0	71	12.82**
Fair-Unfair	100	0	0	42.00***
	18	0	82	19.17***
Healthy-Sick	86	10	4	26.00***
	65	12	23	7.88*
Harmonious-Dissonant	90	10	0	31.14***
	18	12	70	10.70**
Successful-Unsuccessful	76	24	0	19.14***
	54	23	23	2.94
True-False	86	14	0	26.57***
	18	12	70	10.70**
Positive-Negative	76	19	5	18.00***
	6	35	59	7.17*
Reputable-Disreputable	90	10	0	31.14***
	41	18	41	1.88
Wise-Foolish	86	10	4	26.00***
	18	18	64	7.53*
Sweet-Sour	86	14	0	26.57***
	12	23	65	7.88*
Modest-Conceited	82	9	9	21.43***
	18	6	76	14.57***
Nice-Awful	95	5	0	36.29***
	24	12	64	7.88*

TABLE 1 (continued)

Trait-pair	Direction of response			\bar{X}^2
	Positive	Neutral	Negative	
Optimistic-Pessimistic	36	10	4	26.00***
	29	29	42	.47
Warm-Cold	95	5	0	36.29***
	41	12	47	3.64

^a Top row of numbers refers to liked persons and bottom row to disliked persons.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

healthy-sick, positive ratings exceeded neutral and negative ratings. Only two adjective pairs (*fair-unfair* and *modest-conceited*) were given ratings that were predominately negative ($p < .001$) and one adjective pair (*clean-dirty*) was rated predominately positive ($p < .001$).

To test further for ambivalence, total rating scores were compared between groups. A total rating score was the average rating given to the 20 adjective pairs. It was found that *Ss* who described liked persons had a mean total rating score of 1.85 with a standard deviation of .45; and *Ss* who described disliked persons had a mean total rating score of 4.42 with a standard deviation of .77. Both means were used to test the hypothesis of $\mu = 4$. A significant difference at the .01 level was found for the liked person group ($t = 21.08$), but none for the disliked person group ($t = 2.19$). However, the variances of the two groups were not found to be heterogeneous at the .01 level ($F = 1.69$).

The results presented above clearly show that situations involving positive interpersonal relations are not equal to and opposite those involving negative interpersonal relations. Thus in a situation where *P-to-O* is positive, *P's* orientation to *O* reflects a general attitudinal consistency, a balance as it were. But when *P-to-O* is negative, both positive and negative elements are simultaneously present resulting in ambivalence. The inconsistency of the latter situation is one of the parameters necessary to modify the limitations of contemporary balance theory as pointed out by Price *et al.* (5).

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A NOTE ON CROSS-CULTURAL PREFERENCES: FRUIT-TREE PREFERENCES IN CHILDREN'S DRAWINGS*

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A. INTRODUCTION

Some years ago Dr. Lauretta Bender (then Chief Psychiatrist of the Children's Service at Bellevue Hospital, New York) observed that the majority of children drew apple trees when picturing fruit trees. This observation appeared to be supported when the present investigator tested children in New York state in a pilot study. These results suggested that a cross-cultural comparison might shed some light on the advancement of the influence of standard Western culture. Throughout Western history the apple has been a favorite fruit. Greek mythology relates the story of how Paris offered a golden apple (Golden Delicious?) to the fairest of three goddesses (3). In the original (Hebrew) version of the Bible the story of Adam and Eve does not feature an apple; the only word used is the generic term for fruit "p'ri" (Genesis, Chapters 2 and 3). However the Christian version as depicted in art frequently shows Eve offering an apple to Adam. Boring (2) stated recently: "Ever since Eden the apple has been the genotype for fruit." The apple, however, is not always mentioned in the biblical story. There are some versions of the Bible in Pidgin English circulating in Central and West Africa that feature either the mango or the orange as the "forbidden" fruit (6).²

It is possible that the factors determining children's drawings of "fruit trees" may be specific to the local culture or they may be more closely related to more universal influencing forces. For this reason it was desirable to determine whether or not children in other countries respond to instructions to

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² The story of Genesis as told in Pidgin English. Personal communication from J. Chapin.

"draw a fruit tree" in the same manner as did those in the pilot study. More specifically, two questions were raised: (a) What fruit tree do children draw in countries where apples are either nonexistent (as in the tropics), or not native (as in South America or the Near East)? (b) If these children did not draw apple trees, what fruit tree did they draw and were there any "culturally specific" patterns in their preferences? The objective results of this survey of children's art work for cross-cultural comparison may be of value to psychologists, psychiatrists, and educators, as well as anthropologists.

The present research was designed as a cross-cultural study to investigate children's preferences when drawing or painting a fruit tree. It was based on the hypothesis that children from all over the world are more likely to picture apple trees than any other type of fruit tree.

B. METHOD

1. *Subjects*

Drawings were collected from 2906 school children of both sexes in 13 countries on five continents (Australia, Brazil, Congo, Germany, Greece, Iran, Israel, Japan, Netherland Antilles, Philippines, Republic of South Africa, United States of America, and Yugoslavia). Subjects' ages ranged between 5 and 12 years. The distribution among age-groups and among sex-divisions was well balanced ($\chi^2 = .08$). In the 5- to 8-year-old group there were 723 boys and 740 girls; and in the 9- to 12-year-old group there were 706 boys and 737 girls. The younger group totaled 1463 and the older group 1443 children.

The children were attending regular classes at public and community schools, or missionary schools. All subjects were given the same task and procedure.

2. *Procedure*

Collaborators and contacts in 13 countries were personally approached by mail and asked to get in touch with local public schools or missionary schools to obtain children's art work for this study. The contacts also acted as translators, since the instruction sheets were in English. The instructions read: "Draw or paint a picture—any scene, in color—with a *fruit tree* in it." If the term "fruit tree" did not exist in the native language (for example, Japanese and Australian Aborigines), the translators were instructed to explain explicitly: "A tree which bears fruit we can eat." This terminology was chosen so that the children could differentiate between fruit-bearing trees, like the oak or pine, and trees bearing edible fruits.

The children were tested by their teachers in groups in the classrooms during regular sessions. Upon completion each child was asked individually to indicate the type of fruit tree pictured. The answer was then recorded on the back of the picture. Sex and age of the child were also recorded; special consideration was given to the Oriental manner of counting age. Before sending the pictures to this investigator, the collaborators translated the children's responses into English and recorded them on the back of each picture. Only one picture from each child was collected.

C. RESULTS

The children's preferences of fruit trees were classified and then evaluated in terms of percentage distributions. Those responses specifying multiple fruit trees were not used. Only pictures with one fruit-tree response were counted in tabulating categories. The results were analyzed by countries. The number of fruit-tree varieties pictured for each individual country were as follows: Yugoslavia ($N = 59$) had the smallest N and the smallest number of five types of fruit trees; Germany ($N = 79$) had six varieties, and Iran ($N = 84$) pictured eight types of fruit trees; the Congo ($N = 120$) had 12 varieties; Brazil ($N = 100$) and the Republic of South Africa ($N = 78$) each had 13 types of different fruit trees; Netherland Antilles ($N = 81$) showed 14 varieties; Greece ($N = 110$) and Israel ($N = 275$) each had 16 types of fruit trees; Japan ($N = 367$) pictured 18 different types, and the Philippines ($N = 382$) had a variety of 23 fruit trees; the United States ($N = 884$) pictured 24 different types, and Australia ($N = 287$) showed 28 different fruit trees.

There were a total of 68 different fruit-tree varieties among the 2906 pictures. It was necessary to pool orange and tangerine responses, because of the collective term of orange-tangerine that was used on the drawings from Japan. Therefore orange and tangerine responses from other countries were also combined. It turned out, however, that the choices for tangerines were most often either nonexistent or very minimal.

Table 1 shows the N and f for the first three preferences for each country. Apple trees were first in eight of the 13 countries, three times in second place, and twice in third place. Apples were the only fruit trees consistently pictured in all countries. Orange-tangerines and bananas were tied for the next most common preferences, being found in 11 countries, followed by cherry trees in 10 countries. (See Table 2.)

To study the significance of apple-tree preferences, 13 individual simple X^2

TABLE 1
HIGHEST THREE PREFERENCES OF FRUIT TREES BY COUNTRY
(Total $N = 2906$)

Country	N	1st preference	f	2nd preference	f	3rd preference	f
Australia	287	apple	75	coconut	46	mango	40
Brazil	100	apple	57	orange- tangerine	19	banana/mango	3
Congo	120	apple	52	orange- tangerine	16	banana	14
Germany	79	apple	62	pear	7	cherry	4
Greece	110	olive	39	orange- tangerine	17	apple	16
Iran	84	apple	35	cherry	27	date-palm	11
Israel	275	orange- tangerine	141	apple	35	pomegranate	12
Japan	367	persimmon	126	apple	68	grape	42
Neth. Antilles	81	apple	26	sugar-apple	18	coconut	10
Philippines	382	coconut	163	banana	52	apple/mango	43
Rep. S. Africa	78	apple	37	loquat	11	orange- tangerine	6
United States	384	apple	533	orange- tangerine	66	coconut/pear	43
Yugoslavia	59	cherry	28	apple	21	plum	6

TABLE 2
ANALYSIS OF 10 TOP PREFERENCES OF FRUIT TREES
(Total $N = 2906$)

Rank	Fruit tree	N	%	N of countries
1	Apple	1060	36.5	13
2	Orange-tangerine	334	11.5	11
3	Coconut	269	9.3	8
4	Banana	144	5.0	11
5	Cherry	128	4.4	10
6	Persimmon	127	4.4	2
7	Mango	99	3.4	6
8	Pear	69	2.4	9
9	Grape	64	2.2	9
10	Olive	48	1.7	2
11-67	All other preferences	564	19.2	13

were performed. All yielded highly significant results at $p < .01$. In all cases the results showed that the distribution deviated significantly from chance.

Table 2 lists the N and percentage selecting each kind of fruit tree. Of all the 2906 pictures, 1060 depicted apple trees. In other words, 36.5 per cent of all drawings were apple trees. The second largest category consisted of orange-tangerines with 334 pictures, which was 11.5 per cent of the total data and one third of the highest frequency. In third place of fruit-tree preferences were coconuts with an N of 269, representing 9.3 per cent of the total and slightly more than one quarter of the top preference. The total from the 11th to the 67th fruit-tree varieties consisted of an N of 563 pictures, or 19.2 per cent of the total data. The first 10 preferences are given in detail (N and per cent) in Table 2.

The distribution of the 1060 apple-tree preferences was analyzed according to age groups. It was found that in the 5- to 8-year-old group 569 preferred apple trees to "other trees"; and in the 9- to 12-year-old group 491 preferred apples to other fruits. This meant that younger children preferred apple trees significantly more frequently to "other trees" than did older children ($\chi^2 = 7.35$; $p < .01$).

D. DISCUSSION

The results of this cross-cultural study generally support the original hypothesis that children from all over the world are more likely to draw apple trees than any other type of fruit tree. Generally speaking—on the basis of the total responses of all 13 countries—this statement seemed correct in view of the fact that of the 67 varieties of fruit trees listed in a total 2906 pictures in this study, more than one third—and by far the largest category—favored

apple trees. The size of the first (apple-tree) category was larger than the second (orange-tangerine), third (coconut), fourth (banana), fifth (cherry), and sixth (persimmon) categories combined.

Analysis of individual countries showed, however, that in five countries (Greece, Israel, Japan, Philippines, and Yugoslavia) apple trees were not the most frequently pictured. Yet, in all 13 countries preferences for apple trees were always among the three highest frequencies. None of the other fruits showed such a strong popularity.

Examination of possible "culturally related" variables reflected some unexpected relationships. Children from tropical climates, where apple trees do not grow (such as the Congo and the Netherland Antilles) drew apple trees more often than any other fruit tree. Results like these raise various questions to which so far no explanations can be given. Some teachers speculated that these preferences reflect an educational pattern. In countries like Germany, or the United States, among others, it is customary to picture an apple when the first letter of the alphabet, "a" or "A," is introduced. Others thought that the Bible story of Adam and Eve exerted an influence on the children, who pictured the apple more frequently than other fruit trees. While this kind of speculation appears well founded at first, serious doubts remain on closer examination. Neither of these two suggestions would apply to the French-speaking Congo, where apple is called "pomme," and "p" comes in the middle of the alphabet. While at school, the children would come in contact with the standard version of the Bible, but in their homes Pidgin English editions would be the more current. These versions of the Bible feature the native mango or orange as the forbidden fruit.

In addition, no satisfactory answer can be offered at present to the intriguing question: "Why do the younger children show a greater preference for apple trees than do older children?" Also, no good clues are available of the processes that prompt a specific graphic representation of any type fruit tree in response to the general statement: "Draw or paint a picture with a fruit tree in it." Investigating imagery and symbolic representations, Carmichael *et al.* in an earlier study said that "when a meaningful word is heard by an individual some process within the organism is initiated which presumably includes receptor activity, neural activity and effector responses. This activity includes the activity of those processes which are held by some psychologists to be the correlates of the introspectively known status of imagery or symbolic representation. These physiological processes are, if the theory is accepted, in part the result of present sensory stimulation, and in part the result of the education of activities and experience of the organism" (4, pp. 84-85).

It certainly may be that the responses are the result of an interplay of various processes. However, one of the most important aspects may be the role of language. In a very recent research by Cawte and Kiloh (5) which was based on an earlier presentation of this cross-cultural study reporting on 10 countries (1), the two Australian investigators gave the same instructions, which were given in the present study, to bilingual Australian Aboriginal children. They stated that "in an experiment designed in such a way as to include cross-over and replication, it was found that children instructed in English to draw a fruit tree tended to draw introduced trees, especially the apple. When the corresponding instruction was given in the vernacular, the children tended to draw native trees, especially the bush banana. This finding provides some evidence in support of the Sapir-Whorf hypothesis, that language heuristically shapes our experiencing of the physical world."

This is an interesting finding. But it is left to further studies to investigate the interplay between language and imagery.

The present cross-cultural study should aid in making available normative data on the kinds of fruit trees drawn preferentially by children in various countries.

E. SUMMARY

Based on the hypothesis that children are more likely to draw apple trees than any other fruit tree, this study evaluated 2906 graphic representations of fruit trees. The pictures were collected from 13 countries on five continents. When all data were pooled, it was found that a significant majority favored apple trees. Apples were most often the biggest class, and always one of the largest categories in each country, including those where apples are not native. However, children generally tended to draw trees which grow in their local environment. While the hypothesis has to be partially rejected with qualifications on a regional basis, this cross-cultural study indicates that it can be accepted on a world-wide basis.

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THE INFLUENCE OF STIMULUS ALTERATION UPON CONCEPT SHIFTS*¹

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A. INTRODUCTION

Studies comparing reversal (R) and nonreversal (NR) concept shifts have consistently reported greater ease of transfer in adult humans for the R than for the NR condition. Kendler and Kendler (6) explain this difference in terms of the acquisition and maintenance of a relevant verbal mediating response in the R group in contrast to a necessary change of the verbal mediator in the NR group. In a similar fashion, Zeaman and House (10) emphasize the mediating role played by a selective observing or attentional response to the relevant stimulus dimension in the R shift. Lachman and Sanders (7) have suggested that the greater ease of transfer exhibited by the R group may be due to the higher degree of verbal association between the labels for the relevant pre- and postshift cues in this condition.

All of these interpretations stress the strength of conditioned responses to cues (or a dimension) that remain relevant during the R shift. However, it is reasonable to assume that, in concept learning situations of this type, the observing responses to the cues that are irrelevant during training have been extinguished or neutralized by the end of training (8). It is therefore possible that the usual difference in shift performance between the R and NR groups may be largely due to the necessity, in the latter condition, of having to reacquire responses to cues that were irrelevant during training and are now relevant in the shift, rather than to the presence of the same relevant dimension throughout training and transfer as is the case with the R condition. The present study was designed to test the possibility that alterations of cues along the dimension relevant during the shift, in the NR group, would reactivate appropriate observing responses to the cues and thus enhance performance in the shift series.

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A secondary but related question dealt with by the present study concerned the role of dimensionality in influencing the rate of transfer. Several studies have compared NR, R, and intradimensional (ID) groups (3, 4). The latter condition consists of maintaining the same relevant dimension throughout training and transfer, but changing the specific cues comprising the relevant dimension during transfer. Comparisons of R and ID conditions have often found the latter group to be superior in rate of transfer (3, 4). However, these studies have also typically changed some of the irrelevant cues during transfer, thereby making it difficult to assess the role of the relevant dimension, as distinct from specific cues. Hence, it was decided to use an ID group in which stimulus alterations were introduced only to meet the defining characteristics of the ID shift: i.e., relevant cues alone were changed. In addition, in order to evaluate the role of dimensionality in performance differences between NR and ID shifts, a second ID condition was employed in which none of the specific cues along any of the three dimensions present during training, either relevant or irrelevant, was present during the shift. This ID group was compared with a NR group which underwent the same degree of stimulus alteration.

B. METHOD

1. *Subjects*

The *Ss* were 130 college undergraduate students. They were drawn from Brooklyn College ($N = 99$), New York University ($N = 23$), and the Fashion Institute of Technology ($N = 8$). The *Ss* from each of these institutions were assigned on a random basis to the various experimental groups. The proportion of *Ss* from each subsample was equated across groups. Eighteen *Ss* were subsequently dropped from the experiment, either for failing to reach criterion on the original task or because of errors in the scheduling of reinforcements. Thus, the data from a total of 112 *Ss* (91 females and 21 males) were analyzed.

2. *Apparatus and Stimuli*

The apparatus consisted of an upright plywood panel, 24 inches \times 17 inches, which separated *S* and *E*. Centered about 4 inches below the top of the panel was an opening, $4\frac{1}{2}$ inches high and $2\frac{1}{2}$ inches wide, in which the stimuli were presented. The opening could be closed by sliding a sheet of plywood down opposing double tracks that were attached to the screen on *E*'s side of the table. Succeeding stimulus objects were made to appear by inserting the cards in the tracks and raising the exposure panel. Above and on either side

of the screen were two five-watt bulbs which could be clearly seen by both *S* and *E*. Attached to the supporting stand on *E*'s side was a knife switch which was wired to the light bulbs and to a 1½-volt battery. On *S*'s side of the panel, attached to the supporting stand, were two push buttons which were connected separately to the light bulbs and to the switch on *E*'s side. The switch, set manually by *E* before each trial, determined which response (which button) was to be reinforced.

The stimulus figures were ½ inches high \times ½ inches wide, printed and centered on 3-inch \times 5-inch white, unlined index cards which were inserted in plastic envelopes. The stimulus patterns varied along three dimensions, form, number (of forms), and color. Either form or number was relevant at some time in the experiment for one or another of the groups and color remained irrelevant for all groups throughout the experiment. There were four values on each of the three dimensions: for form—circle, square, hexagon, and triangle; for number—one, two, three, and four; for color—red, blue, yellow, and green. Any given stimulus series consisted of two of the values, on one of the dimensions, paired against each other with two values from each of the two remaining dimensions randomly associated with each of the values from the first dimension. The following stimulus values (or cues) were paired against each other in one or another series: circle *vs.* square, hexagon *vs.* triangle, one *vs.* three forms, two *vs.* four forms.

3. Design

The experimental conditions are summarized in Table 1. The design incorporated seven groups ($N = 16$ each), involving different training tasks, but the same transfer task.

One half of the *Ss* in each group received training on a form discrimination, half on circle *vs.* square and half on hexagon *vs.* triangle. The remaining half of each group was trained on a number discrimination, half on one *vs.* three forms and half on two *vs.* four forms. The first group was a reversal group (*R*) in which no cues were changed in the shift series and the training dimension remained relevant, with the only change being a reversal of the cue-reward contingencies. The second group was a nonreversal group (*NR1*) in which the *Ss* shifted to a previously irrelevant dimension.

Investigations of *R* and *NR* shifts ordinarily attempt to control for the possible effects of partial reinforcement in the *NR* condition. Although the means of control have not been standardized, several recent studies have employed the technique of changing the cues, in the *NR* condition, which comprise the dimension relevant during training, but which is not relevant during the

TABLE 1
SUMMARY OF EXPERIMENTAL DESIGN AND ILLUSTRATIVE STIMULI

Group	Training		Transfer	
Reversal (R)	<u>R</u> S 1 Y	<u>L</u> C 3 B	<u>L</u> S 1 Y	<u>R</u> C 3 B
Nonreversal (NR1)	S <u>R</u> 2 Y	C <u>L</u> 4 B	<u>L</u> S 1 Y	<u>R</u> C 3 B
Nonreversal (NR2)	T <u>R</u> 2 Y	H <u>L</u> 4 B	<u>L</u> S 1 Y	<u>R</u> C 3 B
Nonreversal (NR3)	S <u>R</u> 2 G	C <u>L</u> 4 R	<u>L</u> S 1 Y	<u>R</u> C 3 B
Nonreversal (NR4)	T <u>R</u> 2 G	H <u>L</u> 4 R	<u>L</u> S 1 Y	<u>R</u> C 3 B
Intradimensional (ID1)	<u>R</u> T 1 Y	<u>L</u> H 3 B	<u>L</u> S 1 Y	<u>R</u> C 3 B
Intradimensional (ID2)	<u>R</u> T 2 G	<u>L</u> H 4 R	<u>L</u> S 1 Y	<u>R</u> C 3 B

Note: In the above table, S = square, C = circle, T = triangle, and H = hexagon; Y = yellow, B = blue, R = red, and G = green; and 1, 2, 3, and 4 = one, two, three, and four forms, respectively. The stimuli comprising the relevant dimension are preceded by R and L, which designate right and left locations, respectively.

shift (1, 3, 4). This procedure was adopted for each of the four NR conditions in the present study in order to facilitate comparison of these data with those of other current investigations using adult humans. This was the only stimulus change made in group NR1. It was recognized that a change of cues along the training-relevant dimension in this NR condition might influence transfer as a function of novelty effects. However, such an influence, if present at all, would be expected to be minimal, since relevant responses to that dimension had already been conditioned by the end of training. Therefore, it was felt that such a group could still serve as a meaningful baseline against which to assess the effects of the additional manipulations in the other NR conditions.

The third condition consisted of a nonreversal group (NR2) in which the shift-relevant dimension had new stimulus values. The fourth condition consisted of a nonreversal shift (NR3) in which the stimulus values comprising

the consistently irrelevant, color dimension were changed in the shift series, while the shift-relevant dimension remained unchanged. The fifth group, the final nonreversal condition (NR4), involved a change of stimulus values along all three dimensions in the shift. Group NR3 served as a control for group NR2, since any obtained superiority of the NR2 condition over the NR1 condition could be attributed to the facilitating effect of novelty, as such, in the former group, as distinct from the effect of stimulus relevance. Group NR4 served a dual function: it permitted a meaningful comparison of nonreversal and intradimensional conditions; and it constituted an additional control for the comparison of groups NR1, NR2, and NR3, since faster transfer in group NR2, in comparison with groups NR1 and NR3, could be the result of adverse novelty effects in the latter two groups, in both of which the novel stimuli were irrelevant during transfer. The sixth and seventh groups involved intradimensional shifts. Group ID1 consisted of a shift to new cues along the previously relevant dimension with the originally (and still) irrelevant stimulus values unchanged. In group ID2, all stimulus values, irrelevant and relevant, were altered in the shift.

4. Procedure

The *S* and *E* sat on opposite sides of a table. Since the stimuli varied along three dimensions, a deck of eight cards was required in order to encompass all possible combinations of stimuli. Stimulus presentation was facilitated by using two such decks, 16 cards in all. Four different orders of these 16 cards were used. This procedure permitted presentation of each of the four combinations of possibly relevant stimuli, number and form, equally often as the first stimulus card shown an *S*. The second card for each *S* then consisted of the remaining values of the number and form dimensions (i.e., both relevant and irrelevant values) that did not appear on the first card. Therefore, in the first two cards presented, *S* saw all stimulus values and dimensions (i.e., both number and form) that were possibly relevant to the task. Four different random orders were developed for the remaining 14 cards with the restrictions that the eight different stimulus cards were shown before any card was repeated and no stimulus value from any dimension was presented more than twice in succession. Upon completion of a deck of 16 cards, the same sequence was presented again.

At the outset of training, all groups received instructions regarding the nature of the task and the basis for receiving knowledge of results. The task consisted of determining the pattern or principle according to which the stimulus cards were divisible into "left" and "right" categories. The *S*'s response

consisted of pressing either the right or left button. If the correct button was pressed, the bulb to which it was connected lit up, informing *S* that he had chosen the correct side for a particular stimulus card. The right and left sides (and, hence, the right and left buttons) represented the correct sides equally often for each of the relevant stimuli in each of the conditions.

All groups were required to meet a criterion of 12 successive correct responses in both the training and the shift series. If, during training, *S* did not solve the problem after six presentations of the eight cards—i.e., 48 trials—he was arbitrarily dropped from the experiment as a nonsolver. After the training criterion was met, all groups, without being informed of a change, were immediately presented with the shift series. A different random sequence of stimulus cards, with the same restrictions as in Series I, was used in the shift series. The *S*s were equated in terms of number shifted to the various form and number discriminations. *S*s were allowed 150 trials to reach the transfer criterion and, failing that, were assigned an arbitrary score (one *S* received such a score) of 150. The *S*s were allowed to proceed at their own pace with the intertrial interval averaging seven seconds.

C. RESULTS

1. Training

The results of acquisition, with number of trials to learn (exclusive of the criterion trials) as the measure of performance, are summarized in the left portion of Table 2. Acquisition variances were tested for homogeneity with the Bartlett test. Chi square = 7.768 ($df = 6$) was obtained, which was non-significant. An analysis of variance performed on the acquisition means yielded insignificant differences among the seven groups ($F < 1$).

TABLE 2

MEANS, STANDARD DEVIATIONS, AND RANGES FOR UNTRANSFORMED TRIALS TO CRITERION

Group	<i>N</i>	Training			Transfer		
		Mean	<i>SD</i>	<i>R</i>	Mean	<i>SD</i>	<i>R</i>
Reversal (R)	16	10.50	3.53	0-48	6.25	9.00	1-33
Intradimensional (ID1)	16	8.63	2.34	0-25	6.38	15.48	0-63
Intradimensional (ID2)	16	9.56	2.30	0-22	1.94	3.19	0-13
Nonreversal (NR1)	16	8.38	2.73	1-29	20.00	26.49	3-112
Nonreversal (NR2)	16	9.50	3.96	0-45	25.13	28.63	3-121
Nonreversal (NR3)	16	7.00	3.40	0-35	21.88	35.32	0-150
Nonreversal (NR4)	16	11.13	3.41	0-45	16.44	22.28	3-97

2. Transfer

The right portion of Table 2 shows the results of performance on the shift series with trials to criterion as the dependent variable. The Bartlett test

yielded chi square = 71.684 ($p < .01$, $df = 6$) indicating a high degree of heterogeneity of variance. A log ($x + 1$) transformation of the transfer data reduced the chi square (6.282) sufficiently to permit the assumption of homogeneity.

A 7×2 analysis of variance was performed on the transformed data derived from separating the effects of the cues, form, and number. The results indicated that the type of shift made a significant difference ($F = 13.63$, $p < .01$, $df = 6/98$), but performance did not appear to be influenced by the type of cue which was relevant ($F < 1$); nor was there a significant interaction of the two variables ($F < 1$). Pairwise comparisons, made with the Duncan Multiple Range Test, indicated that the reversal group required significantly fewer trials to reach criterion than did any of the nonreversal groups ($p < .01$). The results also showed significant differences between each of the intradimensional groups and the nonreversal groups ($p < .01$), but no significant difference was found between either of the intradimensional conditions and the reversal condition; nor did the two intradimensional groups differ significantly from each other. Finally, comparisons of the various nonreversal shift groups with each other did not allow rejection of the null hypothesis.

D. DISCUSSION

It has been previously found that random reinforcement produces cue neutralization or adaptation (8) on tasks similar to that employed in the present study. On the assumption that marked alterations of the neutralized cues will change the probability of the attention or observing responses to them, the reintroduction of these responses does not appear to exert an important influence upon the rate of shifting to a second concept, even when the resuscitated observing responses are to task-relevant stimuli. This conclusion seems especially warranted in view of the fact that four different NR groups, two of them involving changes in the previously irrelevant (now relevant) stimuli, were available for comparison with the R group. Moreover, the various stimulus changes were unsuccessful in producing different rates of acquisition in the test series among the four NR groups. Finally, stimulus alteration along dimensions that were irrelevant during both the acquisition and the shift series (ID2) did not affect the rate of concept attainment in comparison to a group (ID1) for whom, presumably, only attentional responses to the relevant stimuli were functional during the shift.

Using normal and retarded children, Sanders, Ross, and Heal (9) found that a condition, comparable to the NR2 shift, did not facilitate transfer in comparison to a nonreversal shift. A recent study by Bedrosian (1) with

college Ss, reports similar results. Bedrosian also found that a nonreversal condition, in which the shift-relevant cues were altered but the originally relevant cues remained unchanged, did no better than a NR group in which both the originally relevant and shift-relevant cues were changed. This latter finding suggests that the results of the present investigation were not influenced by the procedure adopted for controlling partial reinforcement. The studies by Sanders *et al.* and Bedrosian, together with the present investigation, thus failed to find that simple stimulus changes introduced along the previously irrelevant (and subsequently relevant) dimension function effectively as cues in concept transfer.

Thus, the results suggest the importance, in concept shift behavior, of conditioned responses to the relevant stimuli rather than the extinction of potentially efficacious responses to the irrelevant stimuli. The present results agree with Hammer's (2) finding that, in the acquisition of paired-associates, S does not learn to avoid irrelevant stimuli, a finding which implies the predominating influence of approach responses to the relevant stimuli. They also support the related suggestion of Lachman and Sanders (7) that simple concept transfer may be primarily a matter of extinction of previous relevant responses.

All stimulus changes, in the present study, were made within a stimulus class or dimension. Since the theories of Zeaman and House (10) and Isaacs and Duncan (4) stress the dimensionality of the observing response, the negative findings obtained in the present study do not, strictly speaking, disconfirm this aspect of their formulations. However, Zeaman and House explicitly take novelty into consideration in their theory in suggesting its importance in altering the probability of the observing response. Moreover, they do not seem to specify whether the novelty must consist of a change of the dimension itself or whether changes in the specific cues are sufficient. At any rate, the absence of any change in the rate of transfer due to stimulus alteration would seem to reduce the cogency of such perceptual formulations as that of Zeaman and House, and Isaacs and Duncan.

The results seem especially consistent with a nonperceptual formulation of concept formation, such as the verbal mediation hypothesis proposed by Kendler and Kendler (6). Verbal mediation theory should predict that, where changes are introduced in the stimulus conditions that do not alter the nature of the verbal label that is relevant during the shift, rate of transfer should be approximately the same for groups receiving these stimulus changes (groups NR2 and NR4) as the rate for a group not undergoing stimulus alteration (group NR1). The only condition that would be required for this prediction

is that the mediating response be capable, in some manner, of extending beyond the specific stimuli which are differentially reinforced during initial acquisition: i.e., be dimensional. Comparisons of groups ID2 and NR4 and, less directly, of groups R with ID1 and R with ID2, in rate of transfer, support such an analysis.

The latter finding is also in accord with that of Lachman and Sanders (7), but contrasts with the finding of superiority of the intradimensional shift over the reversal shift in the studies of Isaacs and Duncan (4) and Harrow (3). One difference between the present study and Lachman and Sanders' study on the one hand, and the studies of Isaacs and Duncan, and Harrow on the other, is that the latter investigators altered the cues along one of the irrelevant dimensions in the R condition. No such change was made in the present study or in the Lachman and Sanders study which used a somewhat different procedure. It may be that the introduction of a reversal of the cue-reward contingency in the R condition makes Ss in that group particularly susceptible to the distracting effects of stimulus alterations along irrelevant dimensions. However, Bedrosian (1) has failed to find a difference in rate of transfer between R conditions with and without such stimulus changes.

Isaacs and Duncan, and Harrow interpret their overall findings as supporting the view that (attention to) dimensionality is a major factor in the performance of concept shifts, but that the cue-reward contingencies of the reversal shift lead to negative rather than positive transfer. In contrast, verbal mediation theory, at least as interpreted by Kendler (5), implies that the reversal shift should result in positive transfer. Although the results of the present study also support a dimensional interpretation, the comparable rate of transfer between the R and ID conditions allows the suggestion that predictions based upon the negative transfer paradigm of response reversal, typically encountered in paired associates, nonsense syllable situations do not necessarily extend to conceptual transfer tasks. The latter condition usually involves the use of meaningful stimulus materials and in some circumstances, such as those of the present study, may benefit from the mitigating effects of a mediating dimensional response.

E. SUMMARY

A reversal shift (R) was compared with four nonreversal (NR) and two intradimensional (ID) shifts, in college Ss. The NR and ID conditions varied in degree and relevance or irrelevance of stimulus change in the shift. Group R and the two ID groups were comparable in trials to criterion and all were superior to the NR groups. Stimulus alteration, correlated or un-

correlated with the shift-relevant dimension, failed to influence rate of transfer in any of the groups. Comparison of selected groups supported a view of a hypothesized mediational response as dimensional in nature. The results were regarded as especially consistent with verbal mediation formulations of concept shift behavior.

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AN EXPERIMENT WITH A PROGRAMMED TECHNIQUE OF TEACHING ENGLISH*

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A. THE CLASSROOM APPLICATION

While machines or programmed teaching sets forth a number of hypotheses about the learning or the assimilation of subject matter under its control, the technique does not provide evidence of results under conditions of specific application. Often classroom conditions are introduced that modify or adjust materials to local purposes not apparent in the generalized descriptive matter concerned with the application of teaching machines or programmed texts being studied. Bound programmed content may not necessarily adapt itself to all youngsters within a group. Such considerations as grouping, remediation, achievement, and course sequence may be a limiting or a reinforcing condition under which a procedure or a text may have to be applied in the classroom. Any or all of the aforementioned may be operative in groupings where differences have to be provided through both corrective and developmental lesson content. Individual classroom needs would therefore define the purpose of a teaching device, such as programmed in the book *English 2600* (1) and as used in this study, more so than assumed by its author. A teacher may not wish to study the influence of programmed language usage content on all pupils in grade 8. Instead the teacher may wish to determine the relative effectiveness of the technique upon a slow- or a fast-learning group, the possible contribution of the book *English 2600* as a supplementary aid to the classroom text; or the teacher may wish to study its potential informally as a review workbook. The teacher would not divorce himself from the responsibility of interpreting the curriculum. The possibilities of application therefore open avenues of inferences about which to explore learning techniques for maximum realization of pupil purpose. Hence a classroom reference becomes one medium for attaining objectives rather than the lone criterion of instruction. The psychology of learning and of motivation, it is assumed, would still operate regardless of the way in which the programmed aid is

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applied; however, its purpose would be articulated with the language arts content of the curriculum as was the case of programmed *English 2600*, in the classrooms of this study.

B. THE ENGLISH 2600 PROGRAM

The book, *English 2600*, is a consumable workbook adapted to the principle of specialization and of sequence of exercise in grammar and in language usage. Self-scoring is immediate as can be remediation; however, the latter process is dependent upon an unrelated reference, say a textbook. Mastery tests provide unit evaluations whereby the teacher and the student can obtain a measure of performance on the units as structured in *English 2600*. Some examples of units structured in this book are The Simple Sentence, The Work of Modifiers, Building Better Sentences, and Agreement of Subject and Verb. In addition to the unit tests, a halfway and a final achievement test are provided that permit some insight into status in the language skills assimilated.

A unit test follows a unit of work. Scoring of the test may be done by the teacher, a classmate, or by the student himself. Corrections are made by the student. A halfway test measures progress for the first half of the programmed book, while the final test measures growth for the entire book. To increase the reliability of the evaluation, the scores of the halfway and of the final test were combined for covariance analysis.

The author of *English 2600* justifies the organization of content through the involvement of the principle of reinforcement which, through immediate self-scoring, strengthens the correctness of responses. The condition of feedback or immediate recourse to an answer strengthens behavior: namely, responses, which have brought it about. For reinforcement to be effective, certain conditions must be acknowledged by the student, while progressing through the structured material: (a) reward—namely, follow-up as scoring, correction, and remediation—must take place immediately after a response as an answer is given to obliterate the possible error influence; (b) reinforcement must rely upon or relate to the process being studied, otherwise unrelated learning will displace the programmed; (c) additional reinforcements should be given and should be adequately spaced, otherwise the acquisition of skills is less effective; and (d) contiguity of learning experiences delimits the opportunity for the influence of nonrelated processes upon the acquisition of programmed skills.

Programming as applied to the machines or to the self-motivated approach refers to the processes of choosing, adapting, and structuring of subject matter

to the format or principle of sequential learning through self-administration, self-scoring, and immediate correction of the content. A common format to which programming is set in book binding utilizes multiple choice or completion items to exercises specialized upon a unit of study, such as "Meet the Adjective." Examples of programming set to such a unit follow:

1. a. dog b. large dog
 Does *a* or *b* give us a clearer picture of a dog? _____
2. Each of the following two-word phrases gives you a different picture of a dog, doesn't it?
large dog *old dog*
small dog *brown dog*

The word that changes your picture of the dog is the (first, second) word in each phrase.

The above programming represents the application of content within a teaching unit of *English 2600*. An analysis of the technique illustrates through these samples the potential of subject matter for self-motivated learning, the nature or type of evaluation used, the sequence or hierarchy of subject matter framed, the self-scoring principle utilized, and the constant or machine-like procedure provided for assimilating the specifics or skills contained within a unit or an assignment. Perhaps self-remediation is likewise a contribution, inasmuch as in a restricted dual completion response or in a dual multiple choice response the alternate answer is automatically right. Rules governing the mechanics of language usage, however, must be obtained from an external reference, such as a textbook.

Questions arise from the *a priori* assertions that are made about programmed learning, the basic question being that the concepts of reinforced learning are inherent in the programmed materials but less accentuated in conventional textbook teaching to the extent that differences in achievement of students are due to the nature of the technique applied: namely, to the programming. The assertions of authors of programmed approaches generalize the contributions of such learning as follows: (a) reinforcement is effective in all operational situations regardless of content, method of application, ability of student, background of the teacher, nature of a textbook, etc.; (b) self-motivation is constant and automatically regulated for the scope of the assignment; (c) programming is equally competent and therefore self-recommended; and (d) programming can more adequately serve the range of abilities common to heterogeneous backgrounds of students within a subject or a skill.

C. THE DEARBORN STUDY

Teachers within grades 8 and 9 were permitted an opportunity to study the effectiveness of the programmed book, *English 2600*, for one semester or what appears to be the classroom limit of the content. Analyses were provided through experimental-control situations within the buildings. These results are statistically analyzed under the tabular summary of this report (see Table 1). In addition an opportunity was given to teachers to explore the potential of the book in a less controlled manner. In the latter approach teachers could choose their group, evaluate through a questionnaire their experiments with *English 2600*, and thereby become a part of the initial study of the programmed technique.

TABLE 1
STATISTICAL SUMMARY OF THE EXPERIMENT

Variable	Information
Groups studied	
Experimental	124 students
Control	123 students
Measures used	
Initial	Author's halfway and final test Retest through the above
Final	
Trends test-retest	
Experimental	56% gained 5 or more points; 20% lost 1 to 5 points
Control	33% gained 5 or more points; 23% lost 1 to 5 points
Mean scores of tests	
Initial test	Experimental: 35.36; control: 40.18 Experimental: 40.27; control: 43.02
Final test	
Analysis of covariance	
Equality of errors of estimate	Not significant
Equality of slopes	Not significant
Equality of intercepts	Significant at 3% level
Summary	The advantage of the experimental group on final scores, after allowing for differences between the groups on initial score, was 1.5 points

As an average estimate, pupils were exposed to *English 2600* for about 100 minutes a week of the 250 allotted to the teaching of English in the junior high schools. Teachers structured their own schedules about the programmed books. Since, through randomness of selection, average and below average pupils participated in the experiment, review-remedial as well as developmental usage entered into the teaching plans. Classwork was only

partially dependent upon the programmed approach. A few students with near perfect pretest scores were not involved in the experiment, since it was felt that neither the test nor the programmed book would extend the students sufficiently to contribute a reliable measure of growth. The range of student backgrounds provided a typical picture of needs against the challenge of the contents of *English 2600*. Considerable insight and experience regarding future possibilities were obtained about the potential and the principle of organization of programmed learning as gained through this first formal application of it to subject matter.

A conventional textbook adopted for a curriculum area has a minimum life span locally of five years, during which time some expense may be added for rebinding. It must likewise be considered a machine, since within it are a series of units and exercises planned about specific skills set in order for a sequence of learning. A textbook of English grammar, in comparison to a programmed workbook, is more narrational than drill patterned, explanatory and contextual rather than discretely sentence-structured, review-oriented rather than test-employed as is the case of *English 2600*. A textbook of English is its own source of skills development and of pursuant application to writing and to speaking. The programmed *English 2600* content is drill specialized and separated from context. The end purposes of an English text in grade 8 and of *English 2600* in the same grade should be understood particularly as to potential and as to compatibility of curriculum responsibility.

If therefore a consumable, programmed aid, such as *English 2600*, were to replace a typical English textbook, the cost of replacement over a five-year period of usage would increase the text budget within a grade approximately eight-fold, whether the budget were student- or taxpayer-endowed. Hence research, in many details of which this study is only one, would have to be made before a truly practical answer to this problem could be obtained. There are many value judgments inherent in a decision as to what constitutes significance of operational difference for the introduction of mechanisms directly involved in assignments.

An English text permits a student to extend his reading skills through development of vocabulary, comprehension, and skills of writing. A programmed text, such as *English 2600*, merely recognizes that exercises or tests carefully sequenced are skills sufficient to master a unit in English grammar. If programmed learning involving a sequence of multiple choice or completion items were to dominate the assignments within consecutive grades, then opportunity for attaining reading skills could be significantly curtailed.

D. THE PROCEDURE

The basic comparison of achievement was made through experimental-control groups involved at the Bryant, Edison, Maples, and Woodworth Junior High Schools. The teachers of experimental groups allotted approximately 100 minutes or two-fifths of the weekly quota for the use of the programmed materials. The teacher, through the nature of the group, determined the purpose to which the content of *English 2600* would be adjusted. The basic classroom textbook and required references were used as the curriculum guides for interpreting the content of the course within a grade. This procedure formulated the control variable which was modified for the experimental group by the addition of the bound programmed aid, *English 2600*. The teachers of experimental groups were questioned about their experiences with the technique and with the procedure.

The halfway and final tests that accompany the programmed material were merged as one score on the pretest and on the final test for each student. This procedure increased the number of items for the evaluation and thereby increased the discrimination for the range of abilities represented in the study.

The statistical analysis of the test data was made through covariance. In the absence of matched groups, covariance can attain the same precision by making allowance for individual differences in terms of regression or prediction of final on initial scores. Through the pretest score of any pupil, it is possible to compute the amount by which his final score would be expected to deviate from the final test mean. By subtracting a student's expected deviation from his actual final score, an adjusted criterion score is obtained independent of a pupil's ability. The adjusted scores for a group in a study are compared through mean adjustment scores. The hypothesis under examination through covariance assumes that differences between an experimental and a control group are not due to the methods or techniques under study, but are due to chance fluctuations in the random sample. A minimum statistical significance in test achievement between the adjusted means of the experimental and of the control groups at the 5 per cent level of probability would be sufficient to refute this hypothesis and thereby explain the gains in scores as due to the techniques under study (2).

E. FINDINGS

Through parsing the statistics of the summary table, trends in growth as measured by the initial and final test partly explain the differences in achievement of the two groups in the study. Within the experimental group, 56 per cent of the students gained 5 or more points as compared to 33 per cent for

the control group. There is significance in the difference, 23 per cent, for the technique under study at this point of the comparison. As far as losses are concerned, the differences from initial to final test are insignificant. Within the experimental group, 20 per cent of the students lost 1 to 5 points, but within the control group 23 per cent lost the same number of points. Two conditions should be attached to the above percentages; certainly student self-motivation was a factor and, also, the programming of the *English 2600* materials was effective in reinforcing the fundamentals of grammar. How much each weighted the total result is difficult to say. Time will establish the influence of the former should it be novel in its effect.

The tabular summary presents the most important inference of the study. Through covariance it was desired to establish the extent of the mean difference between the experimental groups or those using *English 2600* and the control groups or those taught by a textbook procedure after allowing for possible differences in ability of the two groups being compared. After the group means had been adjusted, a 1.5 point difference still remained between the experimental and the control groups. The differential was sufficiently large to refute the hypothesis that the achievement differences between groups on the pretest and on the final test were due to chance fluctuations. To restate the latter conclusion, the differences in achievement between the groups in the study can be due to the experimental method utilized; namely, the use of the text and programmed workbook approach. The evaluation was based upon the method suggested for the *English 2600* sequence of grammar experiences. If the findings are related to the approach of this structured content, then additional increments of learning have accrued to consider the material of benefit to the teacher and to the pupil. This first experimental step in research, however, merely established an affirmative value or judgment about the use of the programmed aid. As the next step it becomes necessary to study the carry-over of such programming upon theme writing, standardized test achievement, command of spoken word, and of reading growth. On the other hand, conventional textbooks may have to be appraised from the standpoint of what is truly meaningful material for teaching skills, such as those of English grammar. Perhaps the answer lies not in increasing the budget eight-fold by the addition of an auxiliary aid but by developing units, exercises, and assignments that are much more individual, extensive, and functional, for a sequence of assignments in grammar. The teachers cannot divorce themselves from such responsibility; neither can they afford to demote themselves to a passive role in the teaching process. Programmed materials have forced a new look upon ourselves.

The reactions of teachers were somewhat divided as to the place of *English 2600* in their teaching plans for grades 8 and 9. A few extreme expressions rejected the approach or accepted it as basic to the curriculum. The majority of teachers, however, set a time limit upon *English 2600* which interestingly enough agreed with that of the experiment. Their desires were for 15 to 20 minutes of daily use assigned on an individual basis. A majority of teachers likewise recommended that *English 2600* provide a remedial-review rather than a developmental relationship to the curriculum.

The teachers did not agree upon a specific grade placement for the programmed subject matter. Since the attributes of the procedure appear in the main as remedial-review, then placement can apply to a spread of grades rather than to grades 8 and 9 as studied locally. When teachers were asked to place the content within a specific classroom, their preferences ranged from grade 7 to grade 12, depending upon the background of a group.

The reactions of pupils regardless of ability were dominantly favorable. A consensus of response accepted the programmed material for its organization, individual pace, repetition, and self-scoring. These qualities the students felt were lacking in the classroom text.

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THE RELATIONSHIP OF NEED FOR APPROVAL TO DEFENSIVENESS AND GOAL-SETTING BEHAVIOR: A PARTIAL REPLICATION*¹

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A. INTRODUCTION

Crowne and Marlowe have suggested that college students who score high in need for approval (NA) tend to engage in "avoidant, self-protective behavior in anticipation of social rejection and threat to self-esteem" (4, p. 165). They report evidence from studies by Barthel (1, 2) that demonstrates that these individuals manifest greater rigidity in goal setting and tend to be rated as more defensive by their peers than are students who score low in NA. This paper reports the results of an attempted replication of Barthel's work.

B. METHOD

The cooperation of 43 male freshmen living on one floor of a dormitory was secured by the senior author, who was their resident advisor. They were individually given the Marlowe-Crowne Social Desirability Scale, M-C *SD* (3), and a sociometric measure of social defensiveness (2). The M-C *SD* consists of 33 statements embodying cultural mores. The degree to which the subject responds to these items in a socially desirable direction is taken as an index of his need for approval. The sociometric measure requires the subject to nominate in rank order five corridor members who best fit each of the following descriptions:

Description A—In most situations, he is reasonably flexible and outgoing and makes acquaintances easily. He talks freely with others about personal experiences, both in which he has succeeded and in which he has failed. He is not overly concerned with what others think of him, but spontaneously allows his actions to speak for themselves.

Description B—In most situations, he is fairly rigid in his relations with

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² Now at the University of Connecticut.

others and is cautious in making new acquaintances. When he fails in an endeavor or feels a blow to his pride, he doesn't talk about it and attempts to minimize it even to close friends. He seems overly concerned about what others think of him and goes overboard in trying to give a good impression (2, p. 36).

A nomination score was computed for each subject by summing the ranks he received, using a value of +5 for a 1-A nomination, +4 for a 2-A nomination, etc., and a value of -5 for a 1-B nomination, -4 for a 2-B nomination, etc.

Three weeks following the administration of these measures, each of the subjects was given the dart task used by Barthel. The floor in front of a standard dart board was marked off in one-foot intervals up to 20 feet. The task consisted of 15 trials, five dart throws per trial. For each trial, subjects decided how far from the target they wished to stand, with the understanding that their "score" for a trial would be the number of points on the board multiplied by their distance from the target. The mean of the distances at which each subject stood was computed, and the variance of these distances served as the measure of goal-setting rigidity.³ Subjects with lower variance scores (indicating little change of position) were construed as more rigid than subjects with higher variance scores.

C. RESULTS

The sociometric measure of defensiveness correlated significantly with M-C *SD* scores ($r = -.47, p < .01$). To compare the present results with those obtained by Barthel (2), subjects were dichotomized at the mean (13.77) into high and low NA groups. A *t*-test of significance for the difference between groups in mean defensiveness was significant in this study ($t = 2.22, p < .05$), although the equivalent finding failed to reach significance in Barthel's study ($t = 1.61, N = 120, n.s.$).

Barthel found that M-C *SD* scores related to the variance of the distances at which subjects stood.⁴ In the present study, the findings were in the same direction but failed to reach significance ($r = .28, n.s.$). Comparative *t*-tests

³ Skill in dart throwing is unrelated to the variance measure in both Barthel's study ($r = .03, n.s.$) and the present study ($r = -.10, n.s.$). There is a small correlation in the present study between mean distance and performance ($r = .30, p < .05$).

⁴ In his second study, Barthel had, in fact, administered the dart task under three conditions: positive, neutral, and threatening. Since the neutral condition produced the largest differences in rigidity between NA groups, only this condition was reproduced in the current study, and it is with the data from this condition that the authors' findings are compared.

of significance are presented in Table 1. In both studies, standard deviations of the variance scores are significantly higher for low NA groups ($F = 2.70$, $p < .05$).

There was a significant difference between the mean distance at which high (11.44) and low (12.92) NA subjects stood ($t = 2.41$, $p < .05$). The comparable "neutral condition" data in Barthel's study did not yield a significant difference ($t = .68$, $N = 40$, n.s.), but under conditions of "ego-threat" (see footnote 4), high NA subjects did stand significantly closer ($M = 12.57$) than low NA subjects ($M = 14.24$, $t = 2.75$, $p < .01$).

TABLE 1
A COMPARISON OF MEAN DIFFERENCES IN VARIANCE BETWEEN GROUPS DIFFERING
IN NEED FOR APPROVAL (NA) FOR THE PRESENT STUDY AND BARTHEL'S STUDY

Study	N	M	SD	Diff.	t
Thaw					
High NA	20	5.21	3.82	3.08	1.87
Low NA	23	8.29	6.28		
Barthel					
High NA	20	4.76	2.75	7.37	5.45*
Low NA	20	12.13	5.18		

* $p < .001$.

D. DISCUSSION

The results obtained differ somewhat from those reported by Barthel. In this study, support was found for the hypothesis that approval-oriented individuals are viewed by their peers as socially defensive. In Barthel's study (2), the difference in sociometrically assessed defensiveness between high and low NA groups did not reach significance. Perhaps the more positive findings of the present authors result from the fact that the sociometric measure was administered individually by the subjects' resident advisor, who emphasized the importance of filling out the form seriously and carefully.

The relationship between goal-setting rigidity and NA reported by Barthel did not reach significance, although the findings were in the same direction. The smaller magnitude of rigidity differences in the replication cannot be readily explained; however, the two studies differed somewhat in subject population (Ohio State University fraternity men *vs.* University of Rochester freshmen), and in the fact that the experimenter in the present study had prior acquaintance with the subjects.

A finding consistent for both studies (but not noted by Barthel) was the greater variability of rigidity scores for the low NA group. Approval-oriented

subjects seem to be a somewhat more homogenous group than other subjects with regard to goal-setting behavior.

Approval-oriented subjects stood significantly closer to the target in the present as compared to the original study. Since there is a small correlation between dart task performance scores and distance from the target, it would seem that approval-oriented subjects stand closer despite the fact that standing further away yields a slight advantage. In Barthel's data, significant differences in distance from the target emerged only under "threat" conditions. The fact that the present experimenter was an important figure to the students (i.e., their resident advisor) may have made our "neutral" condition more threatening than had been intended.

E. SUMMARY

In the replication study, results were only partially consistent with those found by Barthel. Approval-oriented individuals were perceived by peers as socially defensive and showed a tendency to perform more rigidly on a goal-setting task. In addition, their goal-setting behavior was more homogenous or predictable, and they stood closer to the target in an attempt to insure success.

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DECREMENT OF AVOIDANCE CONDITIONING
PERFORMANCE IN INBRED MICE SUBJECTED TO
PROLONGED SESSIONS: PERFORMANCE
RECOVERY AFTER REST AND AMPHETAMINE*¹

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A. INTRODUCTION

In a number of experiments conducted by Pavlov and his school, it was shown that in the course of repetition of the conditioned stimulus the conditioned reactions gradually decreased (13). This phenomenon was interpreted as due to the fatiguability of the conditioned reflex or, utilizing a related concept, with a less general term, to reactive inhibition. It was later postulated that during uninterrupted work the increasing reactive inhibition becomes a drive toward rest (9). There are, however, few experiments dealing with the different aspects of the inhibition appearing in the course of extended training or with the effects of the rest. Only a limited number of experiments show a decrement of the performance during long periods of monotonous mental work in men (14). In agreement with the results of Pavlov, Zenicki and Konorski (17) demonstrated that a diminution of the conditioned reflexes was evident in dogs when short intertrial intervals were used. More recently, Boren showed that a decrement of the performance appeared in monkeys given prolonged Sidman avoidance sessions (2).

In a previous paper it was reported that a decrement in avoidance responding was evident in pretrained rats subjected to uninterrupted conditioning sessions in a shuttle-box (3). The decrement appeared when the escape responses were still at a 100 per cent level. The purpose of the present research was to analyze further the phenomenon of the decrement of the conditioned reactions and the improvement induced by rest.

For this purpose inbred mice have been tested in an avoidance problem

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in order to (a) duplicate with mice the experiments performed with rats previously trained and subjected to long avoidance sessions, (b) assess the effects exerted by extended periods of training on the rate of acquisition of avoidance behavior in naive animals, and (c) study the effect exerted by uninterrupted sessions on memory storage processes and animal performance.

The choice of a shuttle-box technique and of mice was dictated by the necessity of analyzing a behavior not subjected to satiation effects in a species of animals in which a performance decrement could be evident after a relatively short time.

B. METHOD

The Ss were 240 DBA2J and 240 C3H/He mice, males, 20 to 25 grams. Eight automated shuttle-boxes divided into two 20×10 cm compartments by a partition in the center were used (4). A small opening (3×3 cm) connected the two halves. The floor consisted of stainless steel rods spaced .4 cm apart. A light (10 watts) was alternatively lighted in the two compartments and used as the conditioned stimulus (CS). The light preceded by five seconds the onset of the unconditioned stimulus (US) and overlapped with it for 25 seconds. A conditioned response was recorded when the mice avoided the US (continuous shock through the grid floor, 1.5 ma) by running into the adjacent compartment within five seconds after the onset of the CS. The intertrial interval was 30 seconds. Spontaneous crossings were punished and recorded as intertrial responses. The absence of escape reactions (freezing) was also recorded. In some experiments a second CS (buzzer) was used in addition to the light. The onset of both the stimuli was simultaneous. Both of them preceded by five seconds the US but the buzzer did not overlap with it, acting as a trace stimulus. The light did instead overlap with the US. Before each session mice were given an adaptation period of 10 minutes in the apparatus. Each group consisted of eight mice. The avoidance responses were calculated by dividing each session of 2500 trials into 50 blocks of 50 trials each. All statistical analysis was based on Student's *t*-test.

C. RESULTS

1. *Avoidance Performance of Previously Trained Mice During Long Conditioning Sessions*

The performance of previously trained mice was studied in a first group of experiments in two strains of mice during a long lasting session of 20 hours and 50 minutes. The animals were pretrained during five sessions of 400 trials each, with intervals of 24 hours, until a constant level of perform-

ance was reached. Figure 1 shows the performance of previously trained DBA/2J and C3H/He mice in the session of 2500 trials. The performance of the two strains during the first block of 50 trials was significantly different (DBA/2J = 70.2 per cent; C3H/He = 50.4 per cent). A significant decrement of the performance was evident in both the strains after the first 400-500 trials. At the end of the session the avoidance responses decreased to a per cent level of 7.1 (DBA/2J) and 3.9 (C3H/He). The escape responses were at a 100 per cent level for the first 1000 trials and always higher than 85 per cent during the rest of the experiment.

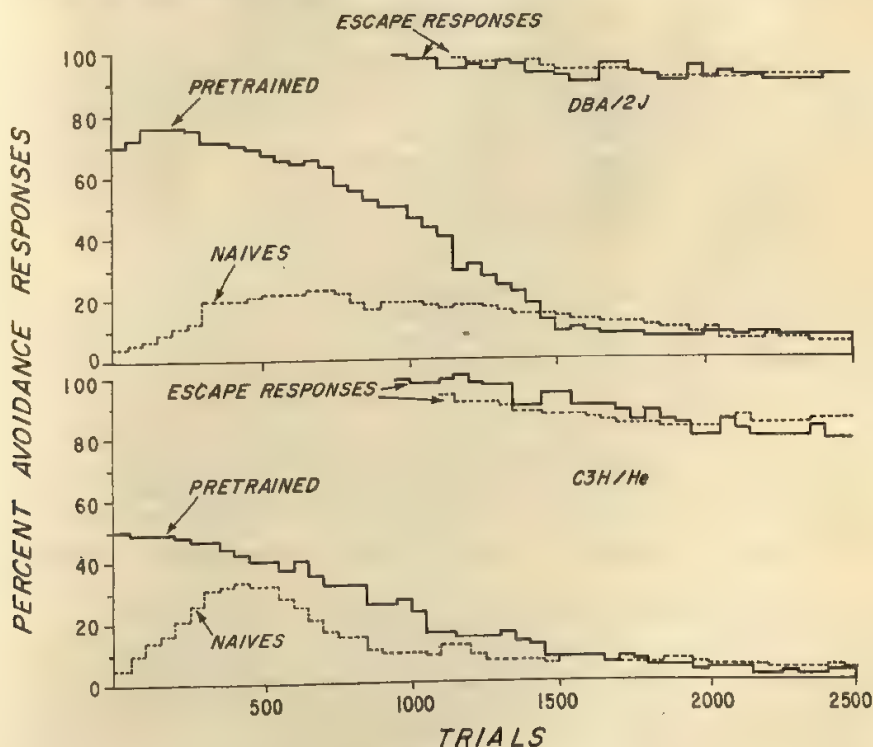


FIGURE 1

PERFORMANCE OF PREVIOUSLY TRAINED AND NAIVE DBA/2J (TOP) AND C3H/He (BOTTOM) MICE DURING A 2500-TRIAL SESSION IN A SHUTTLE-BOX

In order to assess the length of time necessary for a return of the performance to the original levels, at the end of the 2500 trial session different groups of previously trained mice (six groups for each of the two strains)

were again given a shorter session (50 trials) separated by different time intervals from the previous one. Table 1 shows that the performance progressively returned to the level evident at the beginning of the 2500 trials session only after 16 hours. In this regard the two strains did not differ.

TABLE 1
PERFORMANCE OF PREVIOUSLY TRAINED MICE DURING A 2500-TRIAL SESSION
AND DURING AN ADDITIONAL 50-TRIAL SESSION GIVEN AT
DIFFERENT INTERVALS FROM THE PRECEDING ONE

Strain	First block of 50 trials	Last block of 50 trials	Interval between 1st and 2nd session (in hours)	Performance during 2nd session
DBA/2J	72.3 \pm 5.1	6.3 \pm 0.6**	1	21.1 \pm 1.0**
	73.0 \pm 3.8	5.9 \pm 1.0**	2	18.8 \pm 1.4**
	69.8 \pm 5.6	7.8 \pm 0.8**	4	27.3 \pm 1.1**
	75.2 \pm 8.1	8.0 \pm 1.2**	8	39.9 \pm 3.0**
	73.4 \pm 3.1	7.0 \pm 0.3**	16	59.6 \pm 5.7
	71.4 \pm 2.3	6.7 \pm 1.0**	32	67.1 \pm 2.1
C3H/He	50.1 \pm 2.1	4.0 \pm 0.7**	1	3.7 \pm 0.9**
	48.5 \pm 4.3	3.8 \pm 0.5**	2	15.1 \pm 1.4**
	51.3 \pm 2.2	5.1 \pm 0.7**	4	20.0 \pm 3.0**
	47.9 \pm 1.7	4.6 \pm 0.5**	8	31.0 \pm 1.6**
	50.8 \pm 3.2	3.9 \pm 0.5**	16	47.0 \pm 3.1
	47.1 \pm 1.8	4.6 \pm 1.0**	32	43.4 \pm 2.8

Note: Previously trained mice were given a 2500-trial session. A second session of 50 trials was given, separated by varying time intervals from the preceding one. The figures represent the mean per cent avoidance responses calculated on a block of 50 trials.

** Significantly different ($p < .01$) from the initial performance of the same group.

2. Avoidance Performance of Naive Mice During Long Conditioning Sessions

In a second experiment, naive DBA/2J and C3H/He mice were given a session of 2500 trials. Figure 1 shows that the rate of avoidance acquisition was higher in the C3H/He than in the DBA/2J mice. C3H/He reached a level of 33.0 per cent and DBA/2J reached a level of 22.1 per cent. These values represent the highest performance reached by the two strains within the session. A decrement of the performance appeared after the first 500-600 trials. At the end of the session the per cent avoidance responses were, respectively, 6.1 (DBA/2J) and 3.4 (C3H/He). Mice always escaped the shock during the first 1000 trials; during the rest of the session the escape responses

were higher than 85 per cent. As in the previous experiment, six groups of naive mice were given a session of 2500 trials and then tested again in a shorter session (50 trials) given at different intervals from the previous one. The results are reported in Table 2. The mice belonging to the strain DBA/2J attained after an interval of 16 hours a performance level of 67.8 per cent, showing a highly significant improvement when this value is compared to the highest level of performance attained during the previous session. The performance of the C3H/He mice returned, after an interval of 16 hours, to a level corresponding to the highest (peak) level reached during the previous 2500-trial session (see Table 2).

TABLE 2
PERFORMANCE OF NAIVE MICE DURING A 2500-TRIAL SESSION AND DURING AN
ADDITIONAL 50-TRIAL SESSION GIVEN AT DIFFERENT INTERVALS FROM THE PREVIOUS ONE

Strain	"Peak" performance ^a	Performance at the end of the session	Interval between 1st and 2nd session (hours)	Performance during 2nd session
DBA/2J	22.1 ± 1.1	5.3 ± 0.3**	1	12.2 ± 3.7**
	20.9 ± 3.6	4.8 ± 1.1**	2	10.1 ± 2.8**
	23.6 ± 1.4	4.7 ± 0.7**	4	25.7 ± 3.1
	21.9 ± 2.2	5.0 ± 0.8**	8	45.1 ± 4.0**
	23.4 ± 1.5	4.8 ± 1.1**	16	67.8 ± 3.0**
	22.8 ± 2.6	3.9 ± 0.6**	32	70.3 ± 3.5**
C3H/He	31.6 ± 2.7	3.0 ± 1.5**	1	2.8 ± 1.0**
	33.8 ± 1.5	2.8 ± 0.7**	2	3.5 ± 2.2**
	32.7 ± 3.8	4.0 ± 1.1**	4	12.1 ± 1.0**
	30.7 ± 2.4	3.3 ± 0.6**	8	9.9 ± 2.3**
	27.0 ± 3.3	2.9 ± 1.1**	16	26.1 ± 3.2
	29.7 ± 1.0	3.3 ± 0.5**	32	30.8 ± 3.0

Note: Naive mice were given a 2500-trial session. A second session of 50 trials was given at different time intervals from the previous one. The figures represent the mean per cent avoidance responses calculated on a block of 50 trials.

^a This value represents the highest performance (in a 50-trial block) within the session. The mice reached this performance after approximately 400 trials. In this regard no differences between strains or groups were evident.

** Significantly different ($p < .01$) from the "peak" performance of the same group.

3. Effects of Amphetamine and of an Additional CS on the Performance Decrement

A subsequent set of experiments was performed in order to analyze the nature of the decrement of avoidance performance observed at the end of

TABLE 3
EFFECTS OF AMPHETAMINE ON THE PERFORMANCE DECREMENT OF PREVIOUSLY
TRAINED AND NAIVE MICE GIVEN A 2500-TRIAL SESSION

Strain	First block of 50 trials	"Peak" performance ^a	Last block of 50 trials	Performance after saline	Performance after amphetamine (1.5 mg/kg)
<i>Previously trained mice</i>					
DBA/2J	73.1 ± 1.7		6.1 ± 2.3**	7.2 ± 3.0**	
C3H/He	52.2 ± 2.6		3.7 ± 1.0**	4.2 ± 2.1**	
DBA/2J	74.8 ± 2.6		5.7 ± 1.1**		73.6 ± 3.5
C3H/He	50.6 ± 3.8		4.9 ± 2.0**		48.2 ± 2.8
<i>Naive mice</i>					
DBA/2J		22.6 ± 1.0	3.9 ± 1.0***	4.1 ± 0.7***	
C3H/He		30.8 ± 2.7	2.7 ± 0.9***	3.2 ± 1.1***	
DBA/2J		21.8 ± 1.7	5.3 ± 0.7***		68.9 ± 1.9***
C3H/He		33.0 ± 3.5	4.5 ± 0.9***		31.3 ± 2.3

Note: Previously trained and naive mice were given a 2500-trial session. The figures reported above represent the mean per cent avoidance responses (\pm S.E.) in blocks of 50 trials. DI-amphetamine (1.5 mg/kg) was injected immediately after the end of the session. The performance "after amphetamine" was calculated on 100 trials immediately following the injection.

^a This value represents the highest performance in a block of 50 trials within the session.

** Significantly different ($p < .01$) from the initial performance.

*** Significantly different ($p < .01$) from the "peak" performance.

a long uninterrupted session. Two groups of previously trained DBA/2J and C3H/He mice were injected at the end of a 2500-trial session with dl-amphetamine (1.5 mg/kg of the base i.p.). The 50-trial session followed immediately the injection of the drug and produced, in both the strains, a complete recovery of the performance to the level observed at the beginning of the 2500-trial session (Table 3). A similar experiment was carried out with naive mice. Two groups of DBA/2J and C3H/He naive mice were given a session of 2500 trials and injected, immediately after, with amphetamine (1.5 mg/kg i.p.). Table 3 shows that the performance attained a per cent level of 68.9 (DBA/2J) and 31.3 (C3H/He) during 100 additional trials following the injection.

Finally, in another experiment, naive DBA/2J and C3H/He mice were given a session of 2500 trials (CS = light) and tested, immediately after the end of the session, with 50 additional trials in which the CS consisted of the light associated with a buzzer. Table 4 shows that when a new CS (buzzer) was added to the previous one (light), the performance of DBA/2J mice increased to a 67.8 per cent level. Control mice were instead given 50 trials in which the CS consisted of the buzzer only. In this group the performance was much lower. The association of the two CS produced a similar but smaller effect in the C3H/He mice (see Table 4).

TABLE 4
EFFECTS OF THE ADDITION OF A NEW TYPE OF CS (BUZZER) ON THE PERFORMANCE
DECREMENT OF NAIVE MICE GIVEN A 2500-TRIAL SESSION (CS = LIGHT)

Strain	"Peak" performance ^a	Performance at the end of the session	Performance after addition of a new CS (buzzer)	Performance under the new CS (buzzer) in absence of the previous one (light)
DBA/2J	20.7 ± 1.4	4.8 ± 3.0**	67.8 ± 2.2**	12.6 ± 2.1***
	23.0 ± 2.7	2.9 ± 1.0**		
C3H/He	32.4 ± 2.7	3.3 ± 1.2**	31.3 ± 2.0	14.8 ± 1.3***
	30.5 ± 1.0	2.7 ± 0.6**		

Note: Naive mice were given a 2500-trial session (CS = light). The figures reported above represent the mean per cent avoidance responses (± S.E.) calculated in blocks of 50 trials. Immediately after the end of the session the mice were given 50 additional trials in which a new CS (buzzer) was added to the previous one (light). Control mice were given 50 trials by using the new CS in absence of the previous one.

^a This value represents the highest performance in a block of 50 trials within the session.

** Significantly different ($p < .01$) from the "peak" performance.

*** Significantly different ($p < .01$) from the "performance after addition of a new CS."

D. DISCUSSION

The results here reported show that in the course of prolonged sessions of avoidance conditioning a decrement of the performance appears approximately after the first 400-600 trials (three to five hours). This decrement reaches the lowest level approximately after 1500 trials (12.5 hours) and then stays at a constant level during the remainder of the session. The performance was very homogeneous in both strains of inbred mice, confirming the results previously reported with DBA/2J and C3H/He mice (4) and emphasizing the importance of genetic characteristics in behavioral research (7, 11, 12). During a 2500-trial session the performance of previously trained mice decreased from an initial per cent level of 70.1 (DBA/2J) and 50.3 (C3H/He) to a final level of 7.1 and 3.0, respectively. This decrement was also observable in naive animals. In this case, following an initial increment of the performance, the level of avoidance responses reached a plateau and then decreased, after the first 400-600 trials, as reported for the previously trained mice. These results show that a decrement of the performance appears in mice after a relatively short time. In rats (3) or monkeys (2), a decrement appears following avoidance sessions lasting from two to four days, respectively.

The rate of avoidance acquisition was significantly different in the two strains. The mice belonging to the strain DBA/2J showed a higher retention than did the C3H/He strain mice after a pretraining with five daily sessions of 400 trials (Table 1) or when tested in the 16 or 32 hours following the end of the 2500-trial session (see Tables 1 and 2). On the other hand, naive C3H/He mice showed a higher rate of conditioning and a higher performance level than did the DBA/2J strain mice during the initial period of the 2500-trial session (see Table 2). The performance of C3H/He mice after five sessions of 400 trials or 16 hours after the 2500-trial session was lower than that of DBA/2J mice. These last findings are to be interpreted in terms of a previous study (4) showing different mechanisms of memory storage in these two strains. It was in fact suggested that the strain C3H/He was characterized by a better short-term memory, while the long-term memory was better in DBA/2J mice. While the rate of avoidance learning was different in the two strains, both the appearance of the performance decrement and the return to the initial performance after a resting period were quite similar in DBA/2J and C3H/He mice.

A decrement of performance has been reported in different animal species during the course of extended training sessions (2, 3) or in experiments based on the repetition of short conditioning sessions over a period of many days (1, 5, 17). Depending on whether Pavlovian or operant conditioning

was used, decrement in the performance was ascribed to a fatiguability of the conditioned reflex (16) or to a modification of the level of vigilance and to sleepiness of the animal (2). A decrement in avoidance conditioning of rats trained in a shuttle-box has also been considered from a different point of view (1, 5, 17). These studies were generally based on the repetition of short conditioning sessions given to rats over a period of many days. A negative effect on avoidance performance has been ascribed to the tendency to "freeze" and to fear (6, 15). However, few attempts to quantify the freezing behavior have been made (10). The conditions of the present experiment are different in that the animals were tested within the same session continued over a long period of time and no freezing behavior was observed.

The various results and theories reported above will be discussed in relation to the present experiment.

1. It seems difficult to ascribe the decrement of the performance to freezing or to fear. No lack of escape reactions was observed in the mice during the first 1000 trials, and the decrement of the performance appeared at the same time in both naive and previously trained animals. The hypothesis of an "experimental neurosis" as described by Hebb (8) may also be rejected because the decrement was transient and the performance progressively returned to the original levels within 16 hours.

2. The positive effect of the rest and the gradual return to the previous performance after an interval of 16 hours seem to favor the hypothesis ascribing to "fatigue" a major role (2). Also the sudden and complete recovery of the performance after amphetamine, a typically awakening amine, could be interpreted in the same manner. However, for other reasons, the "fatigue" hypothesis is not completely satisfactory. First, the decrement of the escape responses was still lower than 10 per cent when the performance decrement reached an 80-90 per cent level. Second, mice were not asleep or tired at the end of the session. The authors performed an experiment in which mice previously housed for a period of two weeks in an activity wheel (Acme, Model AC-66MF) were given a session of 2500 trials. At the end of the session mice were housed again in the wheel. The animals did not rest or sleep but immediately started to run.

3. The results could be interpreted by ascribing the decrement of the performance to a reduction of the level of vigilance. This reduction is not connected to the animal's exhaustion or fatigue but seems to be specifically connected to the CS. The hypothesis of Pavlov (13) suggesting that a reduction of the level of vigilance is connected to an internal inhibition appears valid. The results showing that the addition of a second type of CS (buzzer)

strikingly increased the performance, while the same CS alone was ineffective on the performance decrement, should be interpreted in terms of this hypothesis. Similar results were obtained by Pavlov in his studies: a conditioned reflex that was subject to fatigue when elicited repeatedly was restored when a new CS was added to the previous one (13).

4. A decrement of the performance appears in both naive and pretrained mice. If naive mice were allowed to rest after the end of the session and then tested again, the performance either returned to the level of the previous session (C3H/He) or reached a level much higher than that previously shown (DBA/2J). A similar result was obtained if the animals were injected with amphetamine or when a new type of CS was added to the previous one at the end of the session. This last finding supports the hypothesis that a form of latent learning took place during the whole session, even during the period in which a decrement of the performance was present.

In the most general terms the results suggest that: (a) a decrement of the performance appears after approximately 500 trials in both the strains regardless of whether the mice are naive or pretrained; (b) in the naive animals the rate of learning was a function of the type of memory characterizing the strain; (c) the rest, the injection of amphetamine, or the addition of a new type of CS counteract the decrement of performance induced by uninterrupted training sessions; and (d) the high level of performance which follows, at the end of a session, the injection of amphetamine or a period of rest indicates that avoidance learning, even if hidden by a form of internal inhibition, takes place during the uninterrupted session.

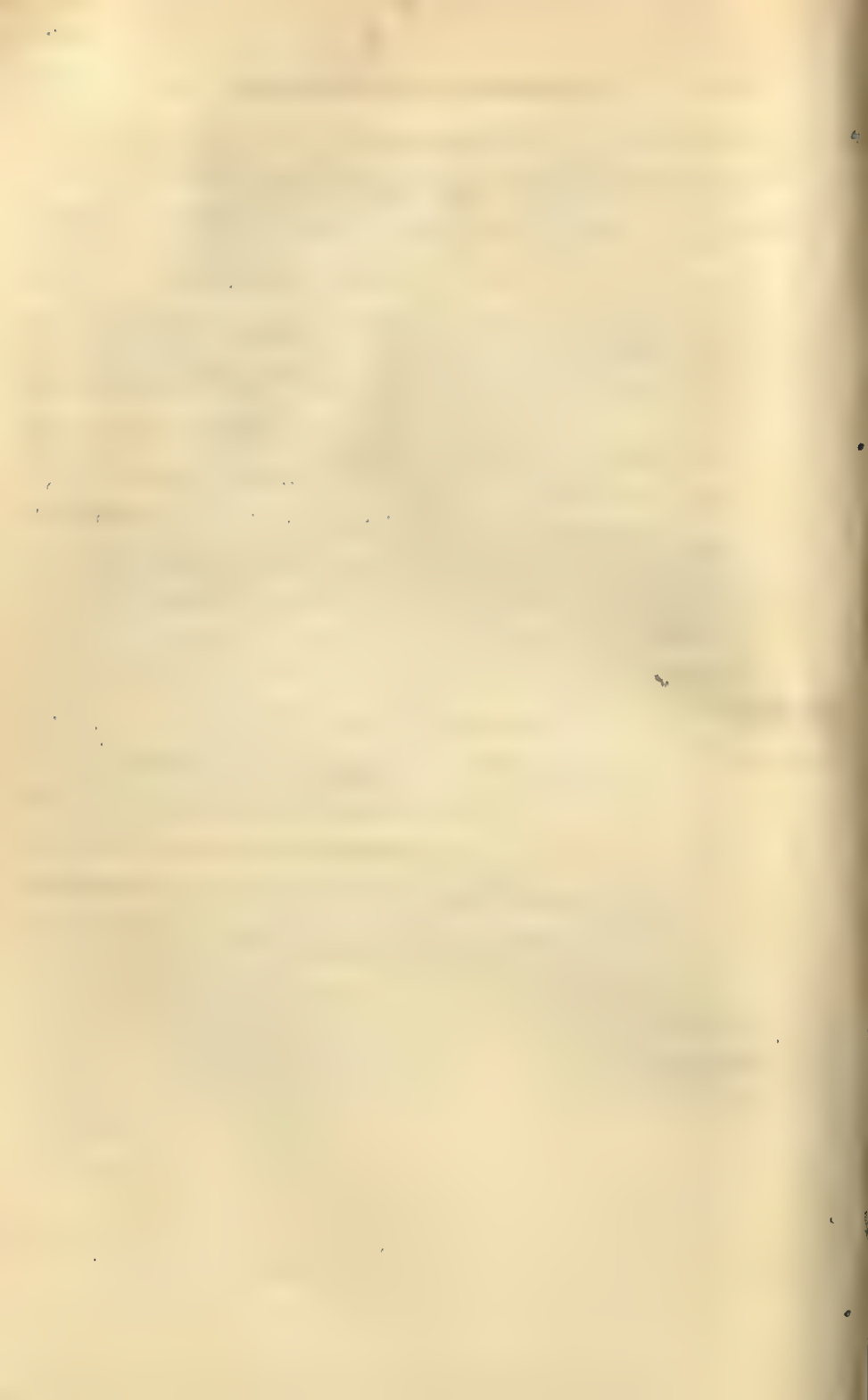
E. SUMMARY

Previously trained and naive DBA/2J and C3H/He mice were given a session of 2500 trials (20 hours and 50 minutes) in a shuttle-box. A performance decrement appeared after the first 500 trials in both naive and pretrained mice, although the escape responses were at a 100 per cent level. In the naive animals the rate of avoidance learning was a function of the type of memory characterizing the strain. The rest, the injection of amphetamine, or the addition of a new type of CS (buzzer) to the previous one (light) exerted a positive action on the performance decrement induced by the uninterrupted training session.

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ALCOHOLICS AND THE INFLUENCE OF AGE ON THE VARIABLES OF THE STRUCTURED-OBJECTIVE RORSCHACH TEST (SORT)*

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A. INTRODUCTION

The construct validity of the Structured-Objective Rorschach Test (1) as a clinical instrument has been supported by previous studies (2, 3, 4, 5) which used hospitalized veterans and normal people.

The present paper investigates the ability of the Rorschach rationale as exemplified in the SORT variables to distinguish between younger and older alcoholic patients. This investigation tests the hypothesis that there are no significant differences among the SORT variables for chronological age between younger and older alcoholic patients.

B. METHOD

The data for the alcoholic patients were obtained from 100 literate veterans after diagnosis by a psychiatrist. These patients came to the short-term neuropsychiatric treatment service at Brown General Hospital in 1964, 1965, and 1966.

The procedure was to administer the SORT (illustrated edition) to the first 100 literate alcoholic patients—individually as admitted. This sample was divided by age into two groups of 53 and 47 each, with respective age ranges of 34 to 45 and 46 to 72. The mean ages of the younger and older groups were 40.4 ($SD = 3.2$) and 54.1 ($SD = 6.9$), respectively. The mean education grades of the younger and older groups were 10.9 ($SD = 2.8$) and 10.7 ($SD = 2.9$), respectively. The means and standard deviations of the SORT variables for the younger and older age groups were compared. The results are presented in Table 1.

C. RESULTS

Table 1 shows that scores for alcoholic patients on one of the 15 SORT variables differ significantly between the younger and older age groups. The difference for the poor-form-resemblance variable—poor control of mental

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TABLE 1
COMPARISON OF SORT VARIABLES FOR 53 YOUNGER AND 47 OLDER ALCOHOLICS

SORT variable	Age range				
	34 - 45		46 - 72		t
	Mean	SD	Mean	SD	
Whole blot	31.58	5.51	32.47	5.17	.819
Major details	54.00	4.45	53.43	4.35	.645
Minor details	14.26	2.88	13.23	3.20	1.665
White space	10.98	2.65	10.74	2.52	.452
Form resemblance	25.21	4.44	24.51	4.80	.743
Poor form resemblance	14.66	2.86	12.85	2.93	3.083**
Human movement	7.30	3.18	7.38	3.23	.125
Animal movement	10.51	2.79	10.70	2.47	.363
Color-and-form resemblance	13.06	2.60	13.53	2.55	.911
Color-and-poor-form resemblance	8.30	2.49	8.72	2.32	.867
Shading	20.62	3.59	21.30	3.54	.936
Animal figure	33.76	4.17	33.15	4.69	.673
Human figure	21.19	5.44	22.02	4.07	.864
Modal responses	51.91	6.33	52.53	7.05	.461
Rare responses	7.04	3.30	6.43	3.39	.903

** Significant at the .01 level.

efficiency—is significant at the .01 level. This finding suggests that, in Rorschach rationale, older alcoholics tend to have better control than do younger alcoholics in avoiding distractions from their environment and in concentrating upon the task at hand.

D. SUMMARY

The Structured-Objective Rorschach Test (SORT) was individually administered to 100 alcoholic patients in a VA Hospital and divided into two age ranges of 34 to 45 and 46 to 72; the raw scores of their 15 SORT variables were compared. The poor-form-resemblance variable—poor control of mental efficiency—revealed a decrease at the .01 level in the older group of 47 alcoholic patients.

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ALTERNATE FORMS OF THE MULTIPLE CHOICE VERSION OF THE PROVERBS TEST*

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Two versions of the Proverbs Test (1) are currently available. The clinical form of the test consists of three alternate forms of 12 items each. The multiple choice version of the test consists of 40 items arranged in order of increasing difficulty. The 40 correct choices are referred to as Abstract (Ab) responses. The Concrete (Co) score is the number of responses made from among 20 items selected by the author of the test as especially suited for differentiating schizophrenics from normals. Since these 20 were originally selected by means of item analysis, the Co responses are irregularly distributed among the 160 possible test responses such that a split-half division of the test fails to yield an equal distribution of Co items. Gorham (2) has also recommended use of an Adjusted (Adj) score as a "single index (which) combines the discriminatory power of both measures" (2, p. 487). The Adj score consists of the Ab score minus the Co score plus a constant of 10.

In preparation for a recent study (4), it was necessary to develop two objectively scored forms of the Proverbs Test. In order to accomplish this, the multiple choice version of the test was split into two separate forms as follows: items 1, 3, 5, 7, 9, 11, 13, 15, 18, 19, 21, 23, 25, 27, 29, 32, 33, 35, 37, and 39 constituted Form A, and the other 20 items constituted Form B. This division of items equalized the distribution of Co items, while at the same time maintaining the order of difficulty.

The new alternate forms of the Proverbs Test were administered to 34 hospitalized chronic schizophrenics in an effort to determine the reliability of the forms. The mean age of the group was 40.85 years ($SD = 8.57$), the mean education was 11.47 years ($SD = 3.23$), and the mean length of hospitalization was 10.20 years ($SD = 5.26$). Seventeen Ss were administered Form A first and 17 received Form B first. Analyses of variance did not reveal differences between the two groups in age, education, or length of hospitalization.

Reliability coefficients for the two new alternate forms were derived through

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use of the Flanagan formula (3, pp. 379-380). It was found that the Ab scores achieved a reliability of .88, but that the reliability of the Co scores was only .48. Application of Gorham's formula for the combined scores yielded a reliability of .90 for the Adj scores.¹

When the separate scores from each of the new forms of the Proverbs Test were combined, the cumulative 40 item scores closely paralleled those reported by Gorham (1, 2) for the original, intact version of the test (see Table 1). Since the Co score, which was by far the least reliable of the

TABLE 1
MEANS AND STANDARD DEVIATIONS FOR THE PROVERBS TEST

Scores	Gorham	Lasky
Abstract scores		
Mean	16.7	16.02
SD	8.7	8.37
Concrete scores		
Mean	4.7	4.50
SD	3.5	3.94
Adjusted scores		
Mean	20.2	21.55
SD	10.5	10.66

three measures, has been utilized in research only to the extent to which it contributes to the more reliable Adj score, it would appear that the new alternate forms of the Proverbs Test achieved a reliability that should permit their reasonably confident use in future research with chronic schizophrenics.

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¹ Halving the number of items for each of the two new forms required that the statistical constant in the Adj formula also be halved; i.e., $Ab - Co + 5$.

ATTITUDES OF FORMER EMPLOYEES TOWARD THEIR JOBS*¹

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A. INTRODUCTION

A survey of the literature indicates that little if any attention has been directed to the job perceptions of former employees who quit their positions *versus* those who were discharged from their positions. Further, the differences in job attitudes of former employees willing to rejoin the firm *versus* those who are not willing to rejoin the firm also have not been studied. This study concerns itself with the following null hypotheses:

1. Ss who separate voluntarily from their positions have the same perceptions of the company and their former jobs as do Ss who involuntarily separate from their positions.
2. Ss who are willing to rejoin the firm express the same satisfactions toward their former positions and the company as do Ss who are not willing to rejoin the company.
3. Ss who voluntarily separate from the firm are as willing to rejoin the company as are Ss who involuntarily separate.

B. METHOD

1. Subjects

The Ss were 53 male salaried salesmen formerly employed (over a five-year period) with a Pacific Coast foodstuffs firm that distributes its products throughout the western United States.

2. Questionnaire

The mail questionnaire used in this study was composed of 48 open-end items. The items related to such matters as on-the-job training, fringe benefits,

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¹ Opinions or conclusions contained in this report are those of the author. They are not to be construed as necessarily reflecting the views or the endorsement of the Navy Department.

and general working conditions. An additional question was included regarding *S*'s willingness to rejoin the company.

3. Procedure

One hundred fifty-two *Ss* separating between January 1960 and August 1965 were mailed the questionnaire. Forty-six could not be contacted. Of the 106 reached, fifty-three (50 per cent) returned the questionnaire at least partially completed.

Identification numbers were assigned to the questionnaires to guarantee anonymity to the respondents. *Ss* were instructed to answer as much of the questionnaire as they wanted and in whatever depth they wished. Questionnaires were returned directly to the author and not to the firm sponsoring the study.

The open-end items were quantified as follows: A weight of 1 or 2 was assigned depending upon whether the response to the question was negative (unfavorable) or positive (favorable), respectively. In all cases, the questionnaires were weighted jointly by two judges. All of the respondents did not answer all of the questions; however, at least 40 *Ss* responded to each question. Phi coefficients were then performed between 48 items and (a) the separation criterion (whether *S* quit or was discharged from his job) and (b) the re-employment criterion (whether *S* was willing to rejoin the company). With regard to criterion *a*, *Ss* who had quit composed 80 per cent ($N = 42$) of the salesmen responding. With regard to criterion *b*, 42 per cent ($N = 22$) were willing to rejoin the company.

C. RESULTS

Table 1 shows the 17 questionnaire items that were significantly correlated with at least one of the criteria at the .05 level with a two-tailed *t*-test. Correlation coefficients and the levels of significance are presented. It can be seen that five items were significantly related to the separation criterion. Thirteen items were significantly related to the re-employment criterion.

The separation criterion was nonsignificantly related ($r = .19$) with the re-employment criterion.

D. DISCUSSION

The first null hypothesis, that *Ss* who separate voluntarily from their positions have the same perceptions of the company and their former jobs as do *Ss* who involuntarily separate, is rejected. It was found that five of the questionnaire items significantly differentiated the two groups on the separation criterion. The salesmen who voluntarily separated from the com-

pany tended to perceive their job performance as being effective; however, the salesmen who involuntarily separated from the company tended to report ineffective work habits, poor record keeping, and poor customer relations.

The second null hypothesis, that Ss who are willing to rejoin the firm

TABLE 1
QUESTIONNAIRE ITEMS SIGNIFICANTLY CORRELATED WITH AT LEAST ONE OF THE CRITERIA

Item	Separation criterion ^a	Re-employment criterion ^b
Were you making enough money to meet your personal needs?	-.17	.31*
Were your work habits effective?	.34*	-.19
Were your methods of record keeping complete and up-to-date?	.63**	.19
Did you feel you were getting stale in your job?	.36*	.23
Were there any hard feelings between you and any of your customers?	-.52**	-.27
Did you ever feel that you were really "part of the company"?	-.01	.39**
What did you think about the firm's advancement policies?	.12	.31*
Do you think there is any social prestige in working for the company?	-.05	.44**
Did working for the company "do anything for you" or was it a waste of time?	.25	.33*
Did you feel that you had anything in common with your superiors or other co-workers?	.06	.34*
How did your earnings compare with what you could have earned with another firm?	-.07	.32*
Was your job too monotonous?	-.26	-.45**
What did you think about the firm's fringe benefits?	.12	.41**
Would you advise a friend to work for the firm?	.51**	.35*
Did you feel that there was an incentive to do your work?	.26	.43**
Were your suggestions given adequate consideration?	.04	.31*
Did you have any trouble warming up clients?	-.28	-.30*

* $p < .05$ level.

** $p < .01$ level.

^a A positive relationship indicates that those salesmen who quit their positions responded more favorably to the item than did those who were fired.

^b A positive relationship indicates that those salesmen who were willing to rejoin the firm responded more favorably to the item than did those who were not.

express the same satisfaction toward their former positions and the company as Ss who are not willing to rejoin the company, is rejected. The Ss who were willing to rejoin the company answered 13 of the questionnaire items in such a manner as to indicate that they were more favorably predisposed toward the company and their former jobs than were those Ss who were not willing to rejoin the firm. This finding provides evidence for the already

widely held belief that expressed job satisfaction and employee tenure are related (1, 2, 3, 4, 5, 6, 7).

The third null hypothesis, that *Ss* who voluntarily separated from the firm are as willing to rejoin the company as are *Ss* who were involuntarily separated, is accepted. There appears to be no support for the commonly held belief that employees who are fired from their jobs will hold a grudge toward the company because of their dismissal.

E. SUMMARY

Fifty-three male salaried salesmen, leaving the employment of a Pacific Coast foodstuffs firm over a five-year period, answered a 48-item mail questionnaire. The responses were quantified and correlated against two criteria: (a) whether the salesman quit or was discharged from his position and (b) whether the salesman was willing to rejoin the company. At the .05 level of significance, five items differentiated *Ss* on *a*, and 13 items differentiated *Ss* on *b*. *Ss* who were discharged reported poorer work habits and poorer customer relations than did the *Ss* who voluntarily separated. *Ss* who were willing to rejoin the company were more satisfied with the pay, advancement opportunities, and fringe benefits that their former jobs offered than were *Ss* who were not willing to rejoin the company. No significant relationship was found between the separation (*a*) and re-employment (*b*) criteria.

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ANAGRAM SOLVING AND SPATIAL APTITUDE*¹

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A. INTRODUCTION

Anagram solving typically requires repeated attempts to rearrange the anagram letters before a solution occurs. When no overt rearrangement of the letters is permitted, however, the subject must rely exclusively upon the use of symbolic processes in accomplishing these rearrangements. Under such solution conditions, anagram solving appears to be not only a function of many already well-known verbal factors (3, pp. 583-591), but also of non-verbal spatial ability. This suggests the hypothesis that anagram solving situations, which do not permit overt letter rearrangements, should require more spatial aptitude (manipulatory visualization) than do situations in which overt letter rearrangement is permitted, and where the manipulation can be accomplished concretely. Consequently, any anagram solving situation that permits the solver to rearrange the letters physically should minimize the influence of spatial aptitude, since, in this situation, the need for implicit manipulation of visual symbols is virtually eliminated.

To evaluate this supposition, an experiment was designed to test the hypothesis that a substantial positive correlation would occur between spatial aptitude test performance and anagram solving where no overt letter rearrangement was permitted, while the relationship between these two variables would be either negligible or absent under conditions where the solvers were freely permitted to manipulate the anagram letters.

B. METHOD

1. Subjects

The subjects were 27 undergraduate, volunteer students from introductory psychology classes at Hunter College.

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¹ The author wishes to thank Mr. Stanley R. Finn for his assistance in collecting some of the data for this study.

2. Materials

The problem solving material consisted of 10 six-letter, single-solution anagrams. These anagrams were presented on separately lettered tiles approximately $\frac{3}{4}$ inch by $\frac{3}{4}$ inch in size.

3. Procedure

The subjects were randomly assigned and individually tested under one of the two following conditions. Thirteen subjects served under Condition I, while 14 served under Condition II.

Under Condition I or the *Nonmanipulation Condition*, each anagram in the list was presented once for a maximum of three minutes. The subject was informed that he was to try to solve the anagram *without* manipulating the tiles, and that he was to call out his answer as soon as he had solved the problem. To insure that the letters would not be physically rearranged, the six lettered tiles comprising each anagram were fastened together with an adhesive tape that spanned their adjacent bottom surfaces. A new anagram was presented either upon the solution of the previous problem or upon the subject's failure to solve within the allotted three-minute time limit. The total time for the completion of the 10 anagrams was recorded.

Condition II or the *Manipulation Condition* was identical in all respects to Condition I except for the fact that the instructions to the subject clearly indicated that he was free to manipulate the anagram letters in any way he chose. The individual letters in each anagram, although arranged and presented to each subject in the same order as that used under Condition I, were not taped together in order to permit their rearrangement.

In addition to the anagram tests, all subjects were tested under group procedure on the Revised Minnesota Paper Form Board Test (MPFB). The standard procedures for the administration and scoring of the MPFB, as set forth in the test manual (2), were carefully observed. Since the subjects were tested together with the other members of their psychology class at a time and place different from that of the anagram testing, they were not aware that their performance on the spatial aptitude test was related to their anagram solving.

C. RESULTS

A comparison of the performance of the two experimental groups on the MPFB revealed that they did not differ significantly with respect to spatial aptitude ($t = .83$, $df = 25$). The mean and standard deviation for the Non-

manipulation Group were 39.15 and 6.90, respectively, while the corresponding values for the Manipulation Group were 36.42 and 9.34. This finding suggests that the two groups were selected from the same population with respect to spatial aptitude.

The principal comparison to be made, however, was the relationship between spatial ability and anagram solving under each of the experimental conditions. This comparison revealed the existence of a substantial positive relationship, indicated by a Pearson correlation of .54 ($p < .05$), between MPFB performance and anagram solving under the Nonmanipulation Condition. A low, negative, nonsignificant correlation of $-.18$, on the other hand, was obtained between MPFB scores and the Manipulation Condition, suggesting that the positive relationship between spatial aptitude and anagram solving tends to disappear when the need for implicit spatial manipulation is eliminated. The difference between the two correlation coefficients was found to be significant at better than the 5 per cent level of confidence by means of the z' transformation method.

D. DISCUSSION

The results of this experiment were as predicted, and support the conclusion that spatial skills are related to the solution of anagram problems that require the implicit manipulation of letters. Further evidence of this relationship has been obtained in a very recent study (1), where a comparison was made of performance on the MPFB and a 20-minute anagram test consisting of 60 five-letter, single-solution anagrams that had to be solved without physically rearranging the letters. A Pearson correlation of .40, significant at the .005 level was obtained.

It seems clear, therefore, that anagram solving that requires implicit manipulation of symbols also appears to require skills that are measured by tests of spatial aptitude. For situations in which overt manipulation is possible, on the other hand, symbolic reorganization of the problem stimuli is unnecessary, since this can be accomplished concretely. Accordingly, under such conditions, the need for spatial skill is eliminated, resulting in the absence of a relationship between problem solving performance and spatial aptitude.

E. CONCLUSION

It is possible to conclude from the present study that a substantial positive relationship exists between nonverbal manipulatory visualization (spatial aptitude) and the solution of anagram problems that require the implicit manipulation of symbols (letters). Whether this relationship is a general one,

and holds for all problem situations that require the symbolic rather than the concrete manipulation of stimuli, must still be investigated.

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AN EXPLORATION OF SOME BEHAVIORAL TECHNIQUES FOR TOXICITY TESTING* 1, 2

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A. INTRODUCTION

Evaluations of toxic exposures have often included behavioral observations. For the most part, these have been easily observed gross effects described in general terms. Examples are reports of reduced alertness, reduced motor coordination, apathy, and subjective symptoms, such as dizziness, headache, nausea, and various feeling states. Such observations have served as qualitative criteria of reversible damage levels. Concomitant biochemical or physiological measures have provided a quantitative basis for expressing these same levels. The purpose of this study was to evaluate the hypothesis that the use of more refined behavioral techniques, those permitting quantification, may allow (a) for increased precision in the quantitative statement of allowable exposures, (b) for leads to the underlying mode of action of the agent, and (c) for an intrinsic gain in the science of toxicology by completing description of the effects being studied. Suggestions along these lines have been made by Goldberg, Haun, and Smyth (1) and Ruffin (4) who have also provided supporting data for relatively acute experimental conditions.

An especially important goal is the development of behavioral methodology for use in studies of the effects of long-term low concentration exposures. Long-term toxicological studies do not have available the grossly observable behavioral effects sometimes associated with acute exposures. For this purpose behavioral measures must be able to reveal changes which represent less obvious criteria than acute studies and which may develop very slowly in time. It seems necessary, therefore, that the behavioral effects be described in quantitative terms and that the phenomena be observed by methods which

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² Joseph Chereski, Charles Kenney, and Theodore Nalwalk constructed all of the apparatus used. Mrs. Barbara Moner, Mrs. Leah Price, and Mrs. Aldythe Sawyer collected the data, assisted in its analysis, and made important suggestions during the course of the investigation.

are independent of the judgment of the observer. Given such techniques, it is conceivable that behavioral measures may reveal effects in situations where chemical analysis yields very small or trace effects and physiological and morphological effects cannot be discerned. However, even when these other effects are also present, behavioral measures may provide an additional basis for evaluating their importance.

In setting up these experiments, it seemed desirable to use a substance already thought to have behavioral effects. It was also desirable to use one whose mode of action on the body was well enough known to permit making behavioral hypotheses. In addition, in order to reduce habituation as a problem, a substance was wanted which was odorless and tasteless and whose effects were not likely to be noticed by the subject.

Carbon monoxide (CO) was selected as the test agent, not because its effects are completely understood, but because it seemed to come closer to the desired criteria than did most other toxic agents. For example, Schulte (5) has recently reported behavioral effects reflecting central impairment with humans at exposures of 100 ppm CO in a single short experimental session. These effects were more sensitive responses to the exposure than physiological reactions. In addition, it seems reasonably well established that the effects of CO and those of reduced barometric pressure have much in common. Since the behavioral effects of altitude have received some study, an additional basis was available for expecting effects. The purpose of the present study, then, was to study the effects of exposures to relatively low concentrations of CO as a means of evaluating the sensitivity of selected behavioral methods with a view towards the ultimate development of methods for long-term exposure studies.

B. EXPOSURE METHOD

Exposure to CO was carried out in a 125-cubic-foot gassing chamber. Within this chamber each rat was housed in an individual wire cage. Air flow, evenly dispersed through the chamber, was maintained at 4 cf per minute. The box was designed with a slight negative pressure. The gas was introduced into the air stream from a commercial pressure cylinder and a system of valves at a rate appropriate to produce the desired internal concentration. These rates, first estimated by calculation, were modified in terms of air concentration measurements made with a Mine Safety Appliances Company carbon monoxide indicator. The chamber was allowed to equilibrate for 30 minutes before animals were put into it.

C. EXPERIMENT I

1. *Apparatus*

The apparatus was a straight, wooden runway. The animal, released from an 11-inch starting box by the remote opening of the starting box door, ran 66 inches to the goal where it found two 45 mg food pellets as a reward. Measurements were recorded automatically to .001 second of the starting time defined as the time from opening of the door to a point 1.5 inches beyond the door, and of the running time measured through a distance of 11 inches at the center of the running area. One run constituted a trial.

2. *Procedures*

For three weeks prior to training, 26 male, albino rats, of the Sprague-Dawley strain, three months old, were put on a 22-hour food deprivation regime. Following this, they were trained under normal laboratory conditions at the rate of five trials per day just before getting their daily food ration. On the 25th training day, and thereafter, they were placed in the gas chamber for one hour just prior to the daily runs. On Days 25-29 only fresh air (0 ppm) was circulated through the chamber. On Days 30-34 the air contained 500 ppm CO. On Days 35 and 36 the chamber again contained only fresh air. All experimental trials were conducted in uncontaminated air as during the training sessions.

3. *Results*

In considering the problem of the sensitivity of the measures, it seemed possible that the mean of the daily five trials might be less sensitive to the effects of the gas than the first trial alone, or the fastest trial, or the slowest. Each of these was analyzed, therefore. Since they all provided essentially the same results, the data to be presented are based upon use of all five trials. This provides the highest reliability in a statistical sense. In passing, however, it is worth noting that of all the measures analyzed, the slowest trial generally provided the closest estimate of the mean, and the fastest trial tended to be the least affected. A comparable analysis was made for the experiments to be reported below and, generally, the same phenomena were found.

Figure 1 presents the starting and running speeds in three different ways. For each measure there is shown the mean of the five daily trials, the standard deviation between individual animals, σ_B , and the standard deviation within animals, σ_W . The mean represents the average individual variation within the five-trial series: that is, it is a measure of the average self-consistency of individual performance. The geometric mean was used to average the σ_W .

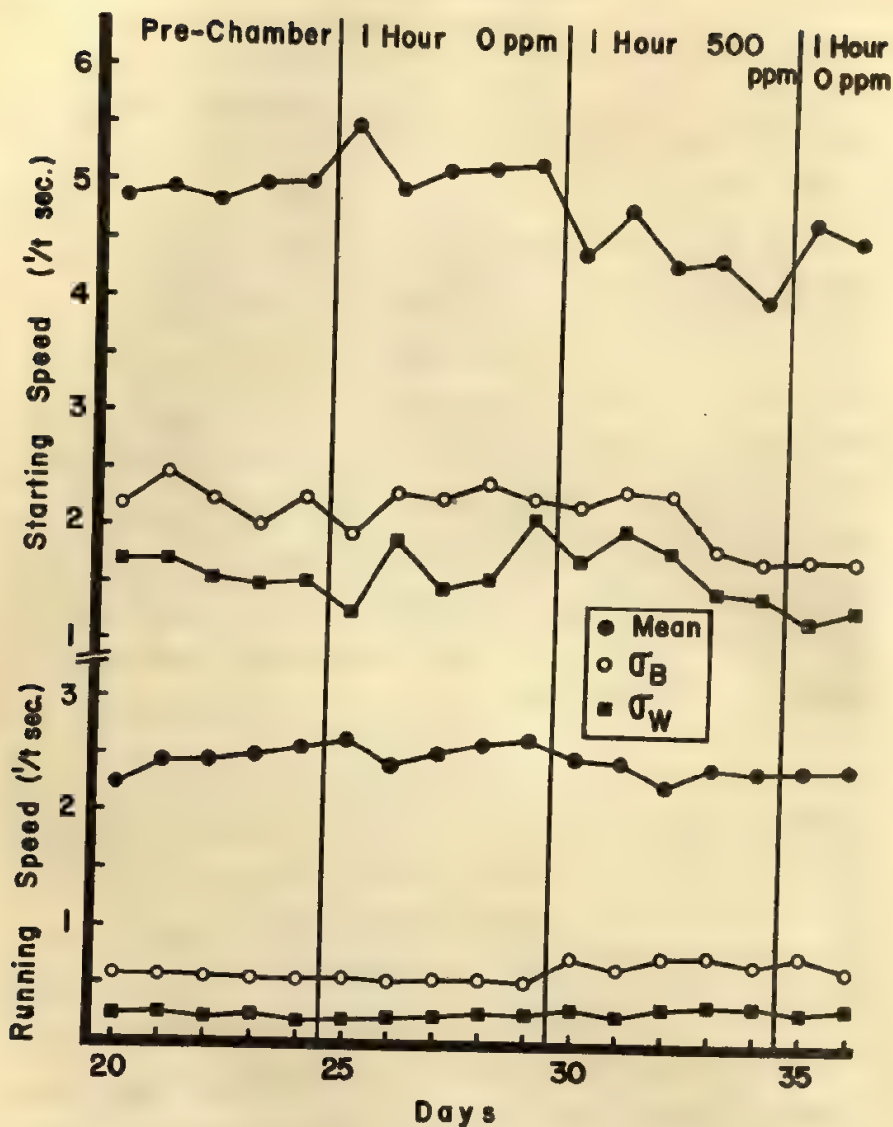


FIGURE 1
MEANS AND STANDARD DEVIATIONS FOR STARTING AND RUNNING SPEEDS
AS A FUNCTION OF CONTAMINATING CONDITIONS FOR EXPERIMENT 1

It may be seen in Figure 1 that the mean starting speed increased slightly during the prechamber period and that this increase extended over to the first day of exposure to the chamber. Following this day, the measures are essentially a continuation of the prechamber trend. This result suggests that the learning process was not complete, but that the remaining increases to be expected with further training would have been small. In any case, exposure to the gas at 500 ppm for one hour resulted in a relatively sharp drop in starting speeds. Analysis of variance supported the decrease shown in yielding a significant main effect of the gas ($p < .0005$). With re-exposure to 0 ppm, starting speed recovered partially. This effect was also significant ($p < .025$). None of the within-day trends was significant, however. As a result the apparent continuing decrease during Days 30-34 cannot be accepted as reliable.

The σ_B of the starting time tended to decrease slightly during the prechamber period, increase slightly during the first chamber period, and then remain roughly flat until the fourth day of gas at which time it decreased. This decrease was never recovered. The σ_W was affected in the same ways, but more strongly. That is, during the 0 ppm phase there was a tendency for an increasing variability in individual performance; this trend was reversed during the gas phase. Thus, the figure suggests that the effect of the exposure was a decrease in starting speed accompanied by an increase in the self-consistency of starting and possibly a decrease in individual differences among animals.

The lower part of Figure 1 shows the running speeds. These may be seen to have been considerably more stable than the starting speeds. The mean curve suggests that the effect of the gas was a very slightly reduced speed of running. Analysis of variance supported this suggestion at $p < .05$. The effect was accompanied by a slight increase in σ_B and σ_W . The data of Days 35-36 do not suggest a recovery, nor was one suggested by statistical analysis.

D. EXPERIMENT II

Since the decrement in performance observed in Experiment I was not overcome with repeated one-hour exposures, no evidence of acclimatization was indicated. This might be expected as a result of daily recoveries following the test periods. Experiment II was performed, therefore, to examine the effects of continuous exposure.

1. Procedures

The procedures used were the same as those of the previous experiment except that following the 22nd day's trials the animals were put into the

chamber and lived there for the remainder of the experiment. The 0 ppm period was Days 23-26; the gas period was Days 27-31; the postgas, 0 ppm, period was Days 32-35. The gas exposure was 500 ppm CO beginning five hours before testing on Day 27. Ten new animals were used.

2. Results

The results are shown in Figure 2 in the same way as for Experiment I. Looking first at the upper portion of the figure, the results show that the effect of the gas was a reduction in mean starting speed and an increase in both measures of variability. The reduction was significant ($p < .001$). All three curves suggest a recovery following the gas period. There is also a suggestion of a beginning recovery in the standard deviations beginning with the second day of the gas period. The apparent recovery in mean speed was not significant, a result presumably due to the size of σ_B .

Figure 2 shows that the running speeds also decreased during the gas exposure and recovered during Days 32-35. Both effects were significant ($p < .005$, $p < .001$, respectively).

E. EXPERIMENT III

1. Apparatus

The apparatus was a standard commercially available Skinner box.

2. Procedures

The animals were trained to obtain 45 mg food pellets as reinforcements for bar-pressing. A 100 per cent reinforcement schedule was used. Fifteen animals, four months old, were adapted to a 22-hour food deprivation regime for three weeks. After a preliminary shaping period of several days, they were trained for nine days, three minutes per day. Following this, the seven poorest performers were discarded. This was a practical step designed to reduce experimental time. Training of the eight best animals continued as usual through Day 18. On Day 19 the animals were placed into the chamber five hours before the day's runs. On the same day, a supplemental feeding period was initiated so that, prior to the day's runs, they were only five hours without food instead of 22 hours. A prior experiment had suggested that a 22-hour deprivation might be sufficient to overcome the effects of the gas, at least for a 1-hour exposure. This day was the first of a pregas, 0 ppm period, which lasted four days. On Day 23 the gas was introduced, 500 ppm, five hours before the day's trials and maintained at this level until the animals

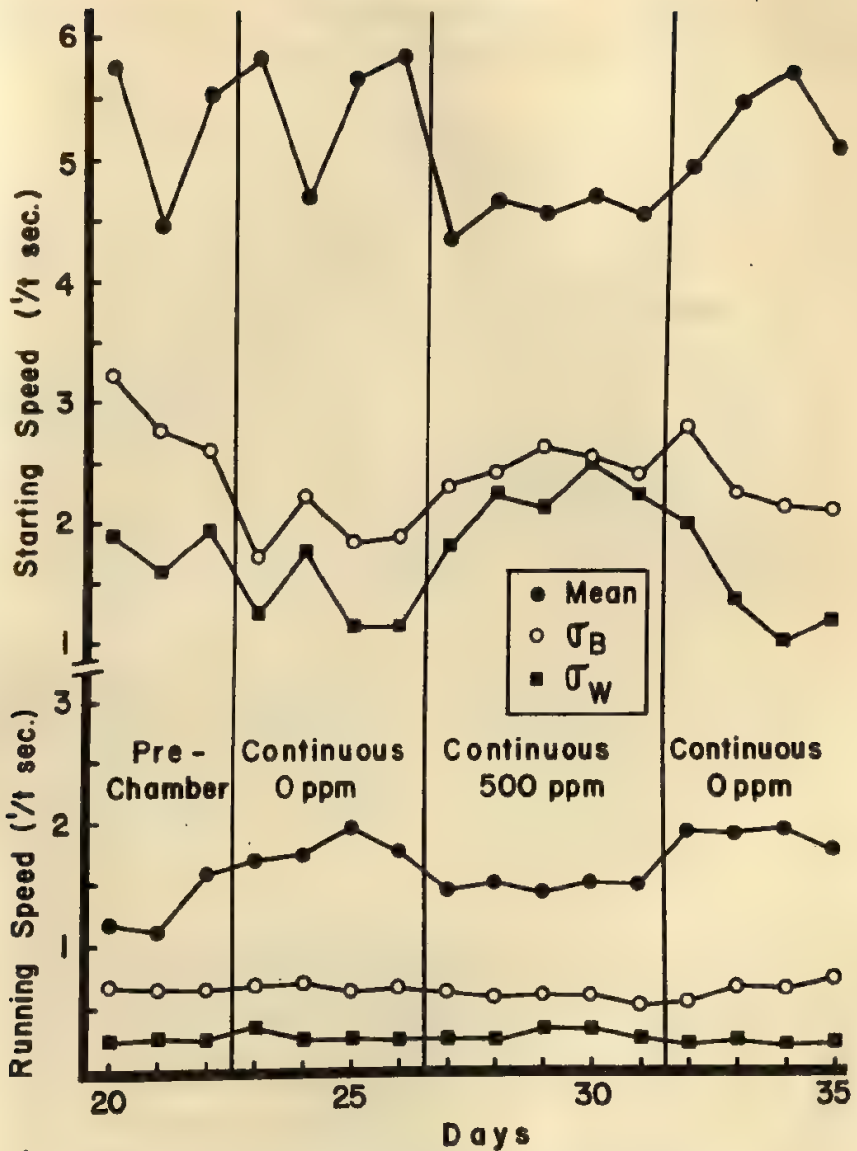


FIGURE 2
MEANS AND STANDARD DEVIATIONS FOR STARTING AND RUNNING SPEEDS
AS A FUNCTION OF CONTAMINATING CONDITIONS FOR EXPERIMENT 2

had been tested on Day 27. After this the chamber was restored to the 0 ppm condition and the experiment continued through Day 31.

3. Results

The response rates and σ_B are shown in Figure 3 beginning with Day 19, the first day of reduced hunger drive and of exposure to the chamber. The figure shows that the immediate effect of the gas was a drop in response rate. This was supported by the finding of a significant main effect of the gas ($p < .05$). Over the gas period the figure shows a systematic recovery of the mean. This suggested trend was not supported by a significant interaction between Days and the CO treatment. With removal of the gas, the response rate increased markedly and then, by the second postgas day, was back at approximately its pregas level. The general level of recovery was significant ($p < .05$). The interaction with Days was not significant which again suggests that the apparent trend was a random effect. The variability measure also showed a drop during the gas period, an effect which increased throughout that phase of the experiment. It also showed a relatively large increase on the first postgas day. Following this it dropped to still new low levels.

F. EXPERIMENT IV

This experiment was concerned with performance in the shuttle box. Two preliminary experiments suggested that consistent shock avoidance was difficult to obtain with most animals, whereas shock escape could be trained easily. The data also suggested that both responses were probably sensitive to exposures at least as low as 300 ppm CO for one hour, but that such sensitivity might be lost if the exposures were delayed until extensive pretraining had taken place. This experiment, therefore, was concerned with the effects of low concentrations on the highly trained escape response.

The experiment was also concerned with the possibility of increasing the susceptibility of the animal as an effect predictable from the mode of action of the agent. Since CO reduces O_2 transport, it would be expected that anything that increased the O_2 requirement should make the animal more sensitive to the gas. In turn, this should be reflected behaviorally. One way to achieve this expected effect would be to increase the metabolic rate of the animal by acclimatization to low temperature. This would be a particularly useful way, since it has been demonstrated [see Teichner and Youngling (9) and Teichner (6)] that the effect of cold acclimatization is to increase performance, a phenomenon which would provide a stringent test of the increased

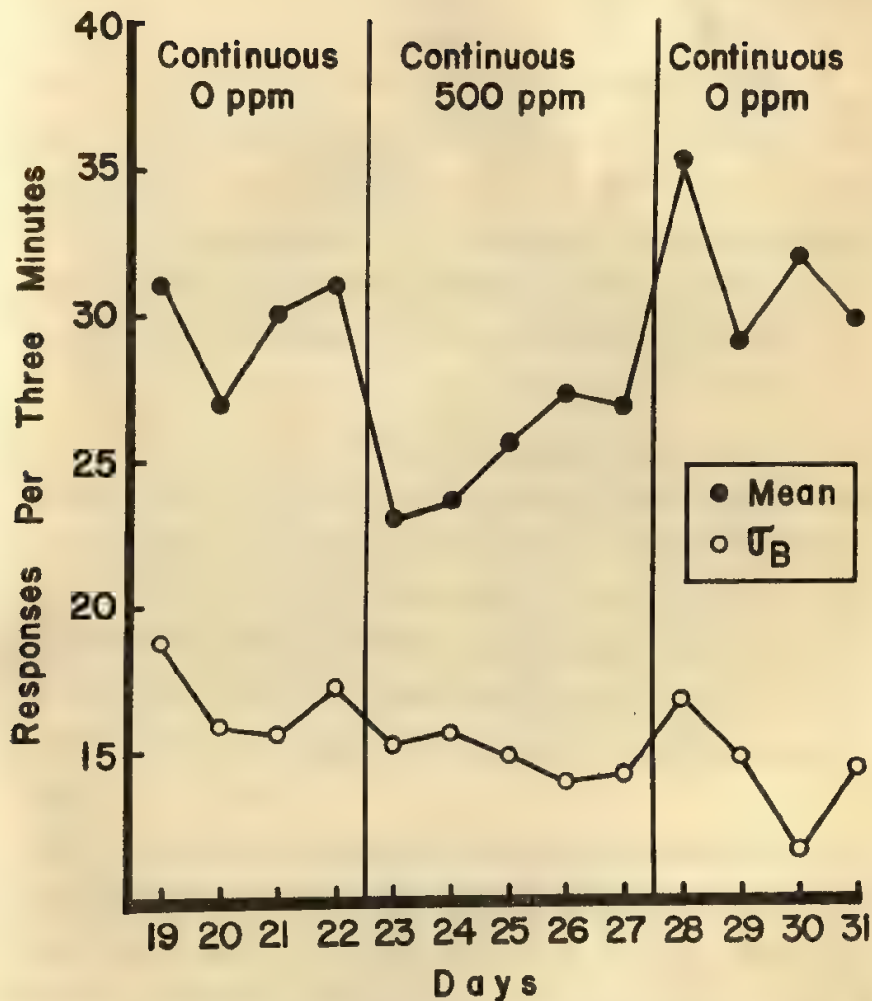


FIGURE 3
MEAN AND STANDARD DEVIATION RESPONSE RATE AS A FUNCTION OF
CONTAMINATING CONDITIONS FOR EXPERIMENT 3

susceptibility hypothesis. The present experiment was designed to test the hypothesis by this method.

1. *Apparatus*

The apparatus was a box separated into two compartments by a 1.5-inch-high metal fence. The rat jumped from one compartment to the other as a response to shock. A red pilot light in each compartment served as a warning signal. When the animal was on a safe side, the opposite side was charged so that it had to wait until the next signal before it could return without punishment. The animal was allowed five seconds from the onset of the warning signal to the onset of a 2.0 ma, "scrambled" grid shock within which to make an avoidance response. During this period the current was off in both compartments. Response times were measured with a photoelectric circuit and an electronic counter.

2. *Procedures*

Fourteen albino rats, 90 days old at the start, were given 15 trials per day for 29 days without experience in the gas chamber. On Days 30-34 they were put in the chamber for one hour at 0 ppm. On Days 35-40 they received 300 ppm and on Day 41, 500 ppm. For four weeks prior to training half of the animals lived in a temperature controlled chamber maintained at 60° F.; the other seven animals lived in a comparable thermal chamber maintained at 74° F. Both groups continued to live under these conditions for the remainder of the experiment. The shuttle box was not temperature-controlled, but in a room of relatively constant temperature. The mean air temperature of the shuttle box with the animal in it was 80° F.

3. *Results*

As expected from the preliminary data, avoidance responses were relatively infrequent. Figure 4 presents the escape speeds of the two groups over the course of the experiment. The training, pregas period, is plotted in blocks of four days which smooths out the high variability which was characteristic of both groups early in training. The remainder of the data are presented on a daily basis.

Figure 4 shows that during the prechamber period the cold-acclimatized group tended to increase its performance at a greater rate and, overall, tended to maintain a higher performance level. The figure also shows that the superiority of the cold acclimatized group was maintained throughout the 0 ppm period, but that the two curves were reversed in relative position

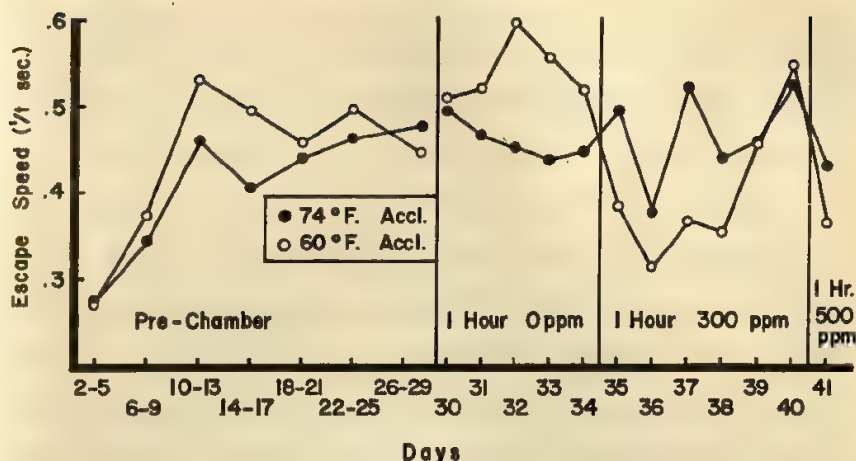


FIGURE 4
ESCAPE SPEED AS A FUNCTION TO ACCLIMATIZATION TEMPERATURE AND
CONTAMINATING CONDITIONS FOR EXPERIMENT 4

during the 300 ppm period. Analysis of variance supported the interpretation of a reversal of effect by yielding a significant interaction between the gas and temperature variables ($p < .05$) over Days 30-40. The cold-acclimatized group exhibited a large decrement in performance, whereas the 74° F. group essentially maintained its previous general performance level although its performance was temporarily reduced on Day 36. The figure also suggests that the cold-acclimatized group recovered its performance on the last two days of the 300 ppm period, but this trend was not significant. The reduction in performance exhibited by both groups with exposure to 500 ppm was supported ($p < .025$).

G. DISCUSSION OF EXPERIMENTS I, II, III, AND IV

The results so far suggested that behavioral measures can be used which are sensitive to exposures of at least 300-500 ppm CO for one hour prior to testing. The effects appeared to be rapid and, if they acclimatized at all, the amount of recovery was small and not supported by statistical analysis.

It is relevant to note that none of the CO exposures had any effect on the usual appearance or grossly observable behavior of any of the animals. Thus, the results indicate a greater sensitivity for controlled than for grosser, more subjective behavioral observations.

Another finding concerns the standard deviations as measures of performance. These measures tended to be correlated with the means. There were

also suggestions in the results that they may be more sensitive than the means. What was suggested, although not consistently, is that the immediate effect of CO is to reduce the difference among individuals, while at the same time each individual becomes more consistent from trial to trial: that is, he tends to be more uniformly poor on all the trials rather than having good trials and poor ones. After the immediate effect, there may be a tendency for both variabilities to increase. The data are only clear enough to suggest that further research on the question might be fruitful.

The finding of an increased susceptibility of cold-acclimatized rats supports the expected relationship between behavioral and physiological effect. On the other hand, the very low susceptibility of the animals acclimatized to 70° F. indicates that the shuttle-box may not provide a very sensitive performance situation unless precautions are taken to increase the susceptibility of the subjects. Similarly, the results of the study do not suggest that bar-pressing for food, as used, provides a very sensitive situation unless the response measure is made susceptible to decrement as by using a weak hunger drive. These findings argue for the use of behavioral measures in toxicological studies, but not without careful consideration of the behavioral phenomena which must be considered for purposes of experimental control.

H. EXPERIMENT V

This experiment was concerned with long-term, low concentration exposure to CO. For this purpose it seemed desirable to have a technique which incorporated:

1. A behavioral measure likely to be sensitive to CO, but not so sensitive that performance would deteriorate too rapidly to permit long term testing. That is, a response was desired which might show a gradual effect with continued exposure.

2. The ability to test at any time of day or night and, in fact, to place the animal on a continuous testing schedule, if desired.

Consideration of the results of the previous experiments suggested that the response should be relatively complex, but measurable in terms of response latency. While measures of error were not rejected, they were considered less desirable than measures of time, since error places an upper limit on the measuring procedures, whereas time measures do so only as the experimenter may arbitrarily allow a fixed time within which to respond. In addition, latency (in contrast to movement time) may be thought of as a measure of alertness and the previous experiments suggested an effect on this process.

To meet the above considerations, a choice reaction was selected. A pre-

liminary apparatus was built which consisted of a square box each wall of which held a flush-mounted switch. Above each switch was mounted a small jeweled light. The onset of a particular light served as a warning signal for the arrival of electric shock presented through the floor grids. Activation of the switch by the animal turned off the shock circuit. The box was constructed of lucite, painted flat black, and served effectively to prevent reflection of the lights by the walls. The lights were small enough in size and intensity so that they could be seen by the animal effectively only with central vision.

The purpose of this construction was to provide a situation in which the animal would have to maintain a continuous scan of the walls of the box to avoid shock successfully. By irregular programming of the signal positions and by equalizing the frequency of occurrence of each, it was possible to maintain an unpredictable threat. Natural biases for any particular wall could be extinguished during early training by biasing the shock occurrence associated with that position. Time measurements were taken electronically from the onset of the signal light to the activation of the correct switch.

In this preliminary work, a variety of relatively short experiments were conducted in the hope of arriving at an optimal means for developing a shock-avoidance response: that is, a response which occurs after the signal but before the onset of the shock. Study was made of the signal-shock interval and of the shock intensity. Experiments were also carried out using intermittent reinforcements and shocks of continuous duration *vs.* shocks of different, short pulse lengths. These experiments were done for a two-choice situation (using two opposing walls), a three-choice situation, and a four-choice situation. The training was necessarily longer as the number of choices increased, but at best the difference in training time was of the order of four days from completion of two-choice training to four-choice.

These results will not be presented, since they were preliminary. They were overwhelmingly clear in indicating that the best avoidance level that might be expected was 50-60 per cent. That is, only a rare rat might be expected to learn to avoid the shock more than 50-60 per cent of the time. This is not an unusual result. It is about the best that has been reported with single response, instrumental avoidance training in the general literature. For our purposes, however, it was not considered good enough. As a result, since time did not permit further exploration of this matter, it was decided to accept a shock-escape response. As will be seen below, to decrease the energizing and signalling effect of the shock, a procedure was used which permitted for a surprise signal, and an expected signal which did permit the

animal to avoid when it could. The situation selected was a two-choice, lever-pressing one.

1. *Apparatus*

The apparatus was a rectangularly shaped, insulated, double-walled, hard-wood box, $16 \times 10 \times 10$ inches inside dimensions. The floor was gridded. The two smaller facing walls contained a small lever and signal light. Ten boxes were constructed and arranged in parallel with respect to the flow of air from a central cooling system. Carbon monoxide was mixed with this air through flowmeters. In addition, each box contained its own in-going flowmeter to provide individual control of ventilation rate. The internal temperature of each box was maintained at $75-80^{\circ}$ F. Ten such chambers were used.

The apparatus was housed in a separate room, but not one which prevented the sounds of control units and experimenter movements from being perceptible. These were minimized as much as possible by low level, continuous masking sounds. The boxes provided no visibility to the outside. Control equipment provided for latency measurements, and intensity. The experimenter selected the experimental box for a given test run by interchanging plugs.

2. *Procedures*

The animals were all pretrained approximately for 20 days in the preliminary apparatus described above. During this time they lived in conventional, individual cages. Following this each animal was housed in its own experimental box where it lived continuously for the duration of the experiment. Except for feeding, once-a-day, and cleaning of the grids and subfloor three times per week, the subjects were completely isolated.

From the first day in the experimental apparatus and on, each animal received six test periods per day, 9:45 a.m., 10:45 a.m., 11:30 a.m., 2:45 p.m., 3:45 p.m., and 4:45 p.m. Each period contained two test trials. The first of these was scheduled at random across animals so that it could not be predicted from the last period. The test signal was also selected at random for the first trial. The second trial received by each animal always followed the first by 10 seconds and always presented the signal to the wall opposite that used on the first trial. The time between onset of the warning signal and shock was five seconds; shock intensity was 1.0 ma. Counting the first such test day as Day 1, the following schedule was used: Days 1-14, 0 ppm CO; Days 15-27, 100 ppm; Days 27-30, 200 ppm; Days 31-35, 0 ppm; Days 36-61, 100 ppm; Days 62-72, 0 ppm. The selection of this particular schedule was based upon a continuous, although necessarily incomplete, evaluation of

the first trial data upon which to draw for predictions; no other means were available for judging the required lengths of exposures.

3. Results

Since the signal-shock interval was five seconds, unless the response were severely affected by the exposure, it could be expected to occur usually within about 5-7 seconds of signal light onset. Occasional very slow responses could be identified as probably due to error. The most frequent cause of these errors was traceable to dirty portions of the grid, an event difficult to control, since it could happen just before the signal as the result of feces spreading. To prevent these very long responses from unduly influencing the data without eliminating them (since there was always the possibility of a nonerroneous long duration response), latencies greater than 10 seconds were arbitrarily scored as 10-second measures. The data were then transformed to reciprocals, a transformation which tended to normalize the data and to reduce the effects of extreme values.

A comparison of the six periods suggested that the trends were similar for all. Therefore, the data were pooled across periods for each of the two trials separately, to provide a single reciprocal value per trial, per day, per animal. A plot of the means of the 10 animals over the course of the experiment, starting with the first testing day is shown in Figure 5.

Figure 5 shows that the first of the two trials always had a longer latency (less speed of response) than did the second trial except on Day 1. During the first 14 days, the second trial increased consistently in speed until about Day 10 after which it was relatively constant from day to day; the first trial did not show an increase over this time, but tended to be relatively stable from Day 7 and on. Thus, the performance of the animals was fairly stable by the six days or more of the initial 0 ppm period.

The data were subjected to a variety of analyses of variance, each permitting comparisons of portions of the total experiment. For clarity of presentation, these comparisons will be described separately.

a. Days 3-14 vs. 15-26: This compares all but the first three days of the initial 0 ppm period with the whole first 100 ppm period. Figure 5 suggests a slight general reduction in speed on each trial as a result of the CO. This was not supported by a significant main effect of treatment conditions. Over the CO period, especially on Trial 1, there is a suggestion of an initial loss followed by a recovery to the final levels of the preceding control period. This observation was supported by a significant Treatment \times Days interaction ($p < .01$) on both trials. The figure suggests that for Trial 2 the

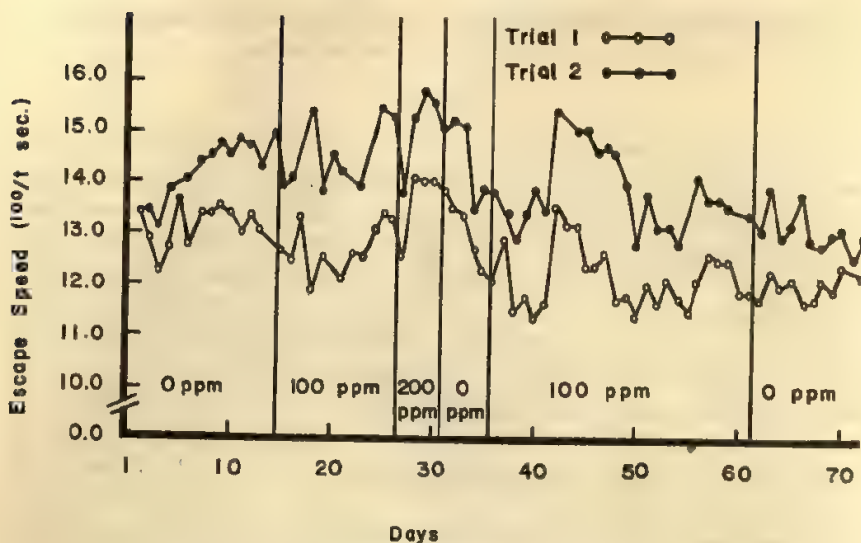


FIGURE 5
RESPONSE SPEED AS A FUNCTION OF CONTINUOUS EXPOSURE TO LOW
LEVEL CARBON MONOXIDE FOR EXPERIMENT 5

significant interaction might have resulted as much from the increasing trend during the first period as from anything that happened during the exposure. On the first trial, however, the data are fairly stable during the first period, whereas they tend toward a U-shaped trend during the exposure. Thus, at least on the first trial, the results suggest that continuous exposure to 100 ppm produced first a decrease, and then a recovery of latency.

b. Days 15-26 vs. 27-30: This compares exposure to 200 ppm with the preceding 100 ppm exposure. The figure suggests that the effect on the first day at 200 ppm was a sharp drop in performance. By Day 2 performance had recovered. An analysis of variance was performed only on the last three days of each period to determine whether the suggestion of better performance during these days in the second (200 ppm) period was supportable. For both trials the main effect of Treatments was significant ($p < .05$) which does support the suggestion. No other effect was significant.

Inspection of Figure 5 shows a trend toward increasing response speed over the last portion of the 100 ppm period. The last three days of the 200 ppm period are not unreasonable extensions of these trends. Thus, these results suggest that the effect of the 200 ppm exposure was an initial loss in performance with recovery of the previous performance trend by the second day of exposure.

c. *Days 27-30 vs. Days 31-35*: This compares the 200 ppm period with the 0 ppm period which followed. The figure shows a continuous loss in performance on both trials over the whole 0 ppm period as compared to the final 200 ppm level. Statistical analysis of *Days 27-30 vs. Days 32-35* yielded a significant treatment effect ($p < .01$) for Trial 1 and for Trial 2 a significant treatment effect ($p < .01$) and a significant Treatment \times Days interaction ($p < .05$). No other effects were significant. This suggests a reduced performance following removal of the gas from the air.

d. *Days 31-35 vs. Days 36-61*: This compares the second, longer 100 ppm exposure to its immediately preceding 0 ppm period. The figure suggests that the initial portions of the 100 ppm period were a continuation of the previous 0 ppm trends. Analyses of variance of *Days 31-35 vs. Days 36-40* yielded a significant Treatment effect ($p < .01$) for both trials; for Trial 1 *Days* ($p < .01$) and Treatment \times Days ($p < .01$) were significant, whereas for Trial 2 the only additional significant effect was Treatment \times Days ($p < .05$). These results are somewhat difficult to interpret, since they tend mainly to continue the preceding trend. It seems clear that performance during the initial portion of the 100 ppm exposure was poorer than during the preceding period. Only the Trial 2 data offer any possibility of interpreting this as a gas-exposure effect, since the main effect of trials was not significant for that trial, and since the figure does suggest that the last day of the 0 ppm and the first day of the 100 ppm conditions were reversals of the previous decreasing trend. Thus, the renewal of the decreasing trend beginning with the second 100 ppm day could have been a CO effect. The data are not clear enough to do more than speculate on this possibility, however.

Analyses of variance of *Days 31-35 vs. Days 40-44* yielded a significant Treatment \times Days interaction ($p < .01$) for both trials. Figure 5 suggests that this interaction resulted from the trend reversal and recovery of performance shown for Days 40 and 41 followed by a new decreasing performance trend. The main effect of Treatment was significant only for Trial 1 ($p < .01$) which suggests for this trial that the gas did affect the average level of performance over the analysed number of days. For Trial 1, *Days* was also a significant ($p < .01$) effect.

Analyses of variance of *Days 31-35 vs. Days 44-48* indicated that only *Days* was significant ($p < .01$) for the data of the two trials. The figure suggests again that the day-to-day measures followed a trend. Since nothing else was significant this portion of the 100 ppm period may be accepted as not different from the preceding 0 ppm period.

Analyses of variance of *Days 31-35 vs. Days 48-52* yielded a significant

treatment effect for Trial 1 ($p < .01$), but not for Trial 2. In both cases Days was also significant ($p < .05$ for Trial 1; $p < .01$ for Trial 2). Inspection of Figure 5 shows that on Trial 1 the general level of performance in CO had now reached a level lower than the preceding control period. This accounts for the treatment effect. The failure of the Trial 2 data to drop below its preceding control level suggests that Trial 1 might have been a more sensitive testing method.

The analyses of Days 31-35 *vs.* Days 52-56 yielded significant treatment effects for both trials ($p < .01$) and significant Treatment \times Days interactions ($p < .05$ for Trial 1 and $p < .01$ for Trial 2). Inspection of the figure indicates that this was a period of relatively stable performance and in both cases at a level clearly below the preceding control levels.

Analyses of Days 31-35 *vs.* Days 56-60 yielded a significant treatment effect ($p < .01$) for both trials. Figure 5 indicates that the significant treatment effect on Trial 1 was due to the fact that even though response speeds showed a recovery over this period, they remained below the general level of the preceding control. The same phenomenon is suggested by the plot of Trial 2, but, as noted, this is not supported statistically.

e. Days 51-61 vs. Days 62-72: This compares the final 0 ppm period with the end of the preceding 100 ppm exposure. Analyses of variance yielded only a significant Days effect ($p < .01$) for Trial 1. Inspection of Figure 5 indicates in agreement for Trial 1 that there was no difference in general levels due to the experimental change. The figure suggests a continuing downward trend for Trial 2, but since this was not significant, these data must also be interpreted as indicating no effect due to the removal of the gas.

Inspection of Figure 5 over the entire second 100 ppm period, considering the within-period results described, suggests a cyclic effect of this exposure. That is, there was an initial drop in performance, followed by a temporary recovery, followed by a second drop which was to approximately the level of the first drop, and this in turn was followed by a second recovery, but one which was not as complete as the first one. Inspection of the first 100 ppm period suggests a similar phenomenon as far as the period goes. Although the effect differed in specific characteristics, exposure to an increase in CO level from 100 to 200 ppm also resulted in an initial drop followed by a complete, and, in fact, increased recovery level. The general nature of the results shown in Figure 5 for the exposure periods suggests the possibility that the animals followed a cycle of decreasing, then recovering performance with the amount of recovery decreasing over time. However, the results are not sufficiently clear to permit that this be considered as more than an interesting hypothesis.

I. DISCUSSION OF EXPERIMENT V

There were many ways in which the apparatus and the procedures might have been improved. Particularly important were the following: (a) some method of cleaning the grids so as to insure the presentation of shock would have been highly desirable; (b) an automatically programmed trial series would have been highly desirable to reduce the cues available to the animals resulting from the experimenter's activities. Both can be assumed to have reduced the sensitivity of the method. The second can be accomplished by available programming methods, but the first will require a unique approach of some sort.

In spite of the deficiencies noted, the results contain much of interest. In particular, they tend to agree with the shorter-term experiments in suggesting that the loss of performance observed with CO exposures does not acclimatize. Of interest is the possibility of cyclic recoveries of successively lesser amounts with prolonged exposure. Since the performance decrement level remained essentially the same while the suggested recoveries decreased, the data suggest a maximum performance loss level which is probably a function of the concentration used. Along the same line of speculation, the cyclic period may also be expected to depend upon the concentration.

The results also suggest that the first trial was more sensitive to the procedures used than was the second one. Since the first trial was fairly unpredictable in time, whereas the animal could always predict the second trial, the results suggest that measures which reflect alertness are probably most sensitive to CO. This too is in general agreement with the preceding experiments.

It would have been of value to have determined the standard deviations as measures of the effect. Unfortunately, this measure was necessarily highly biased by the artifactual long latencies noted above.

J. GENERAL DISCUSSION

The purpose of these experiments was to evaluate the usefulness of behavioral measures in toxicological studies. The methods used were by no means inclusive of all that can be done, but they do represent a reasonable sample of instrumental conditioning procedures. Each one can be refined considerably over what was used. The data, however, suggest that the most fruitful development in adapting instrumental conditioning methods might be along the lines of procedures which allow for reliable measures of response latency, and by introducing added stress or other special conditions which affect response time.

Carbon monoxide was selected as the test agent on the assumption that it cannot be detected by the animal and that, therefore, olfactory responses and adaptations can be ruled out in interpreting the results. While this is reasonable, it might have been better to have selected a test chemical which is detectable, since then changes in performance might be relatable to adaptive or nonadaptive changes in detection sensitivity. In turn, then, it might be possible to determine, for example, whether recoveries in performance occur even when the animal is aware of the stimulation or whether they depend upon a lack of awareness. Similarly losses in performance might be related to changes in sensory response. A successful technique for measuring sensitivity or the subjective intensity of respiratory atmospheric contaminants for use with animals is now available [see Teichner (8) and Teichner, Price, and Nalwalk (12)]. This technique would seem to have great value in further studies of the sort reported here.

The use of "special" conditions is strongly suggested by the results. That is, the finding of greater sensitivity with thermal acclimatization in the shuttle box experiment, and the finding of greater sensitivity with reduced hunger drive in the bar-pressing experiment suggest that it may be most fruitful to impose an additional psychophysiological stress on the subject in studying its response to low level concentrations. This must be done with care and with due consideration of the physiological and biochemical confounding which might be produced. For these reasons it would be desirable to develop methods which apply the added stress concept, but which do not do so by altering the body state.

An approach to this has been used by the writer (7) in studying rodent repellents. The basic method used a straight runway, the center part of which could be tilted to provide inclines of chosen slopes. In that use of the method, rats ran to uncontaminated food in the goal box, having been fed immediately before on a diet of contaminated food. The results indicated that at a fairly steep incline the speed of running was a very sensitive measure of the concentration of contaminant in food. In the present instance, the animal might be permitted to run from contaminated air in the starting living chamber and runway portions of the apparatus to uncontaminated air in the goal box.

In addition to instrumental conditioning techniques, further study should be made of classical (Pavlovian) conditioning techniques. These are apparently being used extensively in the U.S.S.R. although their effectiveness has not yet been evaluated [see Magnuson *et al.* (2)]. Of particular importance would seem to be the use of Pavlovian techniques for the conditioning of

heart and respiration rates as a means of studying the effects of agents which influence these functions.

Studies of long-term effects, whether for the purpose of developing behavioral methodology or to determine whether a given compound has an effect, are by their very nature studies of the activity, or lack of activity, of mechanisms of adaptation. In considering the present investigation, it appears now that there might have been a gain in sophistication had the study been approached as a problem in adaptation with prolonged exposure rather than as a problem in effect-finding. While the distinction is not easy to make, the adaptation approach seems to be a more positive one. It asks about mechanisms operating and reactions to contaminants. A lack of performance loss may be of as much interest as the occurrence of one. The "what effect" approach, on the other hand, tends to lead to thinking which rejects techniques unless an effect is produced. In this sense it makes the unsupportable assumption that there must be an effect; if there is not it must be the result of an insensitive technique. In other words, the psychophysiology of long-term toxicological exposures should be concerned with the development of methods to study adaptive mechanisms and phenomena, rather than of methods just to test something. The latter leads to a null-hypothesis-like situation; it can never be disproved. In spite of this, the results do support the idea that behavioral methods are likely to be very important and very fruitful in toxicological studies.

For example, although the question of chronic CO toxicity is still unsettled, as recently reviewed and concluded by Morrow (3), "... there are undeniable physiological alterations produced by long exposures to low concentrations . . ." (3, p. 800). The present results, particularly Experiment V if verified, suggests the possibility of a new hypothesis in the field: that is, the hypothesis of a cyclically decreasing recovery. If supported by further research, it suggests the further possibility that the contradictory findings reported may have resulted from the particular termination times selected. One investigator may have stopped collecting data while on a recovery curve; another may have stopped between recoveries. Failure to observe a cycle at all may have been due to the use of insufficiently sensitive measures and of a lack of expectation of a cycle. If true, the present behavioral data have implications for future physiological and biochemical experiments and, therefore, indicate the potentialities of behavioral measures and the importance of further, related research.

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SENTIO, ERGO SUM: "MOTIVATION" RECONSIDERED*¹

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A. INTRODUCTION

The term "motivation" as such seems to be somewhat unpopular in general psychology. It is not difficult to see why. For one thing, psychologists have fashioned diverse terminologies to suit their predilections and to provide descriptions of thought and behavior that satisfy their own perceptions of problems. As a result the literature in the field is rife with concepts, such as "drives," "motives," "needs," "goal-seeking behavior," "ego-involvements," "need-gratification," "self-realization," and "self-actualization." Some of the more sophisticated descriptions utilizing such concepts provide valuable insights indeed concerning the intricacies of behavior and the phenomenology of experience, and keep us from becoming too myopic. But in less cautious hands, they often become oversimplified with a single "need" picked out as an "explanatory" concept, or a hierarchy of needs or motives used to pigeon-hole the whole gamut of human behavior and striving. Often, too, the particular words used not only have different meanings for different investigators but change their meanings with the single investigator as he modifies his concepts to fit his new thinking. Some time ago, P. W. Bridgman noted that "the meaning of a word at any epoch is to a certain extent fortuitous, significant of the special features in past usage of the word which happens to have stuck in the memory of the users" (1, p. 251).

Another reason for the apparent demise of the concept "motivation" is certainly that more "hard-nosed" investigators turn their backs on the term and the vagaries of words substituted for it, as they seek specific mechanisms for specific "drives" and insist that there be some demonstrable referent

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¹ This discussion is in a sense a sequel to a paper published with Dr. William K. Livingston under the title "The concept of transaction in psychology and neurology" (2): It represents in condensed form a small part of a book Dr. Livingston and the present writer had planned to write after working for nearly 10 years trying to bring out the implications for psychology of modern neurophysiological research. The writer had to abandon the plan for the book with Dr. Livingston's death in March, 1966, just after we had spent a month together in Oaxaca, Mexico outlining the various chapters. The whole discussion here owes much to him.

within the organism that can be pointed to and, if possible, measured as explanation for a particular segment of behavior. Historically, this emphasis can perhaps be traced back to Descartes who saddled Western thought with his mind-body dichotomy and his mechanistic, atomistic emphasis wherein the interdependency of all aspects of body, mind, and Self and the realities of process and becoming had no place, an approach from which psychology has only within the past few decades partially emancipated itself as more pockets of holistic approaches appear.

We see, then, a wide gulf between behavioristically inclined psychologists, on the one hand, and those psychologists concerned with the full gamut of human behavior including the apparent self-generation of motives, on the other hand. The former often convey the impression that man is a robot, made up of various neurological centers, glandular activities, and moving parts, but without any overall motive power. The latter are impatient with any traditional mechanistic stimulus-response formulations, seem rather unaware of the revolution in neurophysiology, and continue to use a variety of abstractions as "explanations" without much concern as to what their naturalistic bases might be, getting around the problem with speculative qualities or attributes assigned to the intangible "mind" or "person" and creating systems, subsystems, and taxonomies of all sorts, fitting human experience and behavior into them.

Some people who seek the sources of man's motivation have turned to existentialism, perhaps in despair. But this can only prove to be a *cul de sac*, ending up as it does with a nihilism, an artificial bifurcation between the individual and society, and a complete lack of concern for any accounting based on known facts concerning the human organism. Others turn to modern philosophers of science or epistemologists for answers and solace to the complexities of human behavior which, they insist, is not mechanistic but reveals conscious choice and other characteristic qualities unique to human behavior, which can never be accounted for solely in terms of chemistry, physics, cybernetics, etc. But this, even in the best of hands, seems to lead us into some form of vitalism to explain man's consciousness and human qualities and emphasizes all over again Descartes' old dichotomy, ignoring common sense and common observations as well as modern neurophysiological discoveries.

The resulting situation is that psychology seems rather to be straddling the problem of "motivation": either dealing in many cases with partial problems in precise ways, thus sidestepping main issues; or, on the other hand, fashioning concepts as "explanations," making extrapolations, and not bother-

ing about the possibility of any naturalistic bases for speculation. Because of this state of affairs, other investigators, particularly social scientists, are at a loss to know how to give any valid and adequate account of the complex problems they face when they turn to the psychologist's microcosm for help, whether these problems deal with the family, the community, group or national loyalties and tensions, or international affairs. Often they have to create their own interpretations or fall back on textbook teachings of some simple need theory or unrefined Freudian account.

What the writer is trying to do here is merely to bracket the problem as he sees it, to put his thoughts into the simple language of the empiricist, avoiding technical jargon as much as possible. For the concept of "motivation" dies hard and he feels it can still serve a most useful function for any investigator dealing with the ramifications, the range, and subtleties of individual and social behavior, whether he be a neurophysiologist, a psychologist, or a student of international affairs, if we try to track down what the concept can refer to. The writer is assuming that it is much more important to analyze crucial questions with whatever methods are available, even if they are sometimes fuzzy, than it is to study trivial problems with precise methods and to search for nice quantification. He is particularly interested here in formulating a view of motivation that will at least be consistent with the exciting new developments in neurophysiology reported in the avalanche of information pouring out of the laboratories, in part so that humanistic psychology itself may eventually find some scientifically established underpinning which will clarify definitional problems. It is not the purpose of this article to consider the implications of neurophysiological findings in any detail.² The aim here, rather, is to sketch the broad picture now becoming visible.

B. FEELING AND THE APPETITIVE SYSTEMS

The normal newborn infant can be thought of as a bundle of feelings. When he gets hungry or uncomfortable, he wiggles, tightens up, and makes certain sounds. The baby who has just been fed or relieved of discomfort

² A separate article on this subject will appear with the co-authorship of Dr. Robert B. Livingston, Department of Neuro-Sciences, University of California, San Diego. In a few places the two articles deliberately overlap. A lucid account of recent research in neurophysiology will be found in Wooldridge's book, *The Machinery of the Brain* (20); also in R. B. Livingston's article "How man looks at his own brain: An adventure shared by psychology and neurophysiology" in Koch (8). Those interested in more technical aspects of the research will find excellent summaries in the volumes on neurophysiology (edited by H. W. Magoun) in the series *Handbook of Physiology* (12). See especially the following articles in this volume: Galambos and Morgan, "The neural basis of learning"; Lindsley, "Attention, consciousness, sleep and wakefulness"; MacLean, "Psychosomatics"; and Gerard, "Neurophysiology: An integration." Also see French (6).

gives every impression of being relaxed and produces gurgles of contentment. The feelings of a newborn infant and the undirected behavior accompanying them are built-in activities. They are universal, the same behavior and sounds made by infants in every country the world over. Such early expressions are not expressions of a "mind" or "Self" but of an undifferentiated totality. In expressing these early feelings, the infant, of course, has no conception that anyone will notice them or do anything about them. He seems only to be revealing the fact that "I am uncomfortable" or "I feel great," depending on his bodily state. Descartes would have been more accurate if he had written *Sentio, ergo sum*, since being is more reliably indicated by an awareness of feeling than by any rational thought.

The same point was made by the philosopher John Macmurray in his Gifford Lectures of 1954:

The infant's original consciousness, even as regards its sensory elements, must be feeling, and feeling at its most primitive and undiscriminated level. What it cannot be is a set of discriminated "animal impulses," each with its implicit reference to a mode of behaviour, in relation to the environment, which would satisfy them. We have no ground for thinking that the newborn child can distinguish between a feeling of pain, a feeling of sickness and a feeling of hunger. This discrimination, too, we must assume has to be learned. The most we have a right to assert, on the empirical evidence, is an original capacity to distinguish, in feeling, between comfort and discomfort. We postulate, therefore, an original feeling consciousness, with a discrimination between positive and negative phases (11, p. 57).

When the infant grows up, no matter where he lives he is likely to use as a common greeting the expression "How are you?" "*Comment ça va?*" "*Wie geht's?*" according to the language he has learned. Both he and the person to whom he is speaking will understand what is meant by the question and it will not be hard to respond. It will refer to "well-being" in the broadest possible sense. It is feeling that makes the world go 'round. Goethe said *Gefühl ist alles*.³ It is feeling of some sort reflected by the behavior of any organism that differentiates it from a plant, a machine, or a robot.

While concepts such as "needs," "purposes," "motives," and the like are certainly in no sense "wrong" and good descriptions of them have great heuristic value in helping us understand the phenomenology of experience and behavior, they are not "there" in the organism as entities that have a naturalistic foundation. Hopefully, they themselves, as abstracted ways of starting

³ Immortality of the soul without a body to give it feelings would be a dull and dreary prospect indeed!

at the top to slice experience, can be better understood or take on more precise meaning when seen in the light of systems that seem rooted in the organism and are becoming discernible.

Thus in stressing the role of feeling, the writer hopes he is not merely introducing another word to describe "motivation" but is following the implications for psychology of the neurophysiological discoveries of what he thinks may best be termed two great appetitive systems built into the chassis of all living organisms and that act as tuning mechanisms responding to all the transactions with the internal and external environments. The writer will not describe them in any detail here, since this has often been done before (3, 4, 7, 10, 14, 15, 17, 20). His concern here is with the function of these systems in providing a coloration to experience as a base against which significances are judged.

Suffice it to say that both of what William Livingston and the writer termed "appetitive systems" (2) were discovered in 1954: the first by two young psychologists, J. Olds and P. Milner, then at McGill University, who found that electrical stimulation of certain parts of a rat's brain apparently produced clear-cut feelings of satisfaction, or of experiencing something desirable, of wanting more of the same. Later research has shown that there are many parts of the active brain in all higher vertebrates that produce this approach behavior when stimulated. When stimulation occurs in human subjects, they describe their experiences in terms of elation, deep satisfaction, complete relaxation, and the like. The other great system, first noted by J. M. R. Delgado of Yale, was one which, when the brain was stimulated electrically, produced just the opposite effect with every evidence that the animal was suffering extreme pain, anger, and rage. In human subjects, later research has shown that stimulation of various parts of the brain has been described by them as horror, fright, terror, anxiety, extreme depression, and the like.

Livingston and the present writer used the phrase "appetitive systems" to describe these processes rather than any concept of "centers" corresponding to particular "drives." For the experiential and behavioral effects noted by the electrical stimulation of the brain may well be due to large field effects rather than to the activation of particular nerve cells, or may be due to some pattern of impulses transmitted somewhere else in the brain as well as to a whole array of various "mechanisms." The word "appetite" was used following Aristotle's use of the term and because it can avoid the overtones and loadings of a simple hedonistic pleasure-pain principle. The appetitive systems are much more complicated, varied, and subtle than any pleasure-pain

dichotomy, including as they do both raw emotions and such complex affective states as love, sympathy, and wonder—all of which, too, are subsumed by the concept of “feeling.” These appetitive systems can be conceived of as an orchestration of neural mechanisms or a tuned ensemble of many instruments concerned with all the activities of an ongoing organism which have an affective coloration that influences the organism to approach or move away from situations it learns to perceive may affect it for good or ill. They are, of course, subject to the influence of hormones, glandular activity, satiation, and aging, to mention only a few other components of the orchestration.

The main point to stress here is that it is these primitive, built-in appetitive systems of feeling against which specific purposes are formed and develop even though the relationship is only infrequently and vaguely in conceptual awareness. All sensory data coming into the central nervous system seem to be constantly processed en route by an organism tuned like a fine violin before such data can give rise to conscious perceptions. It is to satisfy feeling favorable to the well-being of the organism that intention develops and without which there is no attention.

Feeling, then, appears to be the great activating force, the motivator against which all else that happens to the human being is measured and judged. It is this coloration of experience, of feeling, provided by the built-in tuning appetitive systems that not only gives the push and motive power to behavior but that is used by the organism as the guide and the *raison d'être* for assigning significances to all the impingements encountered in life and give the occasions of living their quality, coloration, and intensity.

In the many excellent reports of the activity of the reticular activating system (RAS), various descriptive phrases are used by investigators to describe the amazing capacities it has and the functions it serves. It is, for example, called an “awakening” and “arousal” system; it is involved in “focussing attention”; it is used in “selectivity” and “discrimination of what is important or suitable,” “selecting out what is useful to the organism.” We know that the RAS is involved in “habituation,” disregarding what is not important or helpful or necessary to the welfare of the organism; it “registers impressions” and somehow signals, as a computer, its NOW PRINT order of command for recording experiences that may sooner or later be valuable. What is registered is described as becoming “stored” as “weighted averages” for future use as the RAS serves in “regulating,” “controlling,” and “policing” the impacts of environmental stimuli. Briefly restated, the reticular activating system apparently has the capacity to assign significances both to what comes in as stimuli from the external and internal environments and signalling what

behavior, if any, is most appropriate in handling the constant input. William K. Livingston pointed out in 1954 that because of the activity of the RAS it was appropriate and useful to think of a great vertical or transactional component of the nervous system which regulated both input and output (9).

A description of the general situation is given in Ralph Gerard's broadly gauged article "Neurophysiology: An integration":

One last note is due on subjective experience and objective behavior. The latter depends on efferent nerve impulses to appropriate effectors. These neurons are fired by impinging impulses from other neurons, and so by regression to the afferent messages from receptors. But it is clear that not all entering messages or information bits find their way out in prompt action; some, probably most, end by altering the material nervous system and become stored memories or information. With reverberation and feedback and synchrony, much can happen within the brain—and presumably accompanied by some kind and intensity of consciousness, including the unconscious—with no immediately correlated behavior. Conversely, from this rich central store overt behavior can flow which is not immediately related to any input. Such separation in time and type (and locus) of stimulus and response gives the richness and spontaneity of behavior experienced as volition and rationalized as free will. Behaviorism is thus too narrow a straight jacket comfortably to contain the mind; but the alternative is not the "uncaused cause" of a choice by the psyche. Whatever the degree of contingency at each level or organization, there is no place for a directed random event, and a general chain exists—of causality down levels and of purpose up them (12, p. 1952).

Again, to repeat, it would appear that what Gerard describes as "causality down levels and of purpose up them" is basically due to the organism's ceaseless attempt to achieve a feeling of satisfaction and well-being and avoid antithetical feelings. It is this attempt, beginning with birth, that provides the push and pull of living and gives the matrix for the elaborate extensions acquired throughout life to implement feeling, as the recording apparatus begins to function, to bring in information that is registered, "printed," and stored, all of which is colored either by a sense of pleasure and satisfaction or of unpleasantness or pain.

C. EXTENSION OF FEELING AND APPETITIVE SYSTEMS

These primitive, built-in, appetitive systems become quickly extended and conditioned, especially in the human being, as the infant, then the child and the adult transact with their internal and external environments. Simple colorations of feeling, such as warmth, satisfaction of hunger, and the like, with which the infant starts out are soon extended through his trial and

error random movements, signalling to him which ones bring satisfaction and which do not. The infant, as well as the adult, is probably relatively unaware that it is feeling that serves as the guide and director of his activities, impelling him to do what he is doing to make him feel better or not feel worse. Soon, even the young infant begins to learn to direct his behavior and make sounds or movements that will bring his situation to someone's attention for gratification or relief. When the infant begins to develop the capacity to anticipate and make choices, then we can properly say that mind is born.

Concurrently, the infant learns that there is something "out there," independent of his own being that has apparent characteristics and attributes of its own. As he discovers his own body, so he also discovers the externality of the things and people around him, and we can say that at this point Self is born.

Both "mind" and "self" develop, of course, largely according to the particular cultural situation an infant is in as he discovers new and reliable ways of activating his appetitive systems and experiencing the consequences that satisfy or relieve him. He experiences the sensations he does in the way he does as a result of weighing indications in terms of his feelings and of learning more specific purposes within the matrix of feeling as he finds out what is "important" to him and what he can and should be "concerned about." Learning, then, proceeds as a function of the appetitive systems and the accompanying feeling that serves as the compass or selector against which significances are generated and judged and by means of which awareness is extended to new potential satisfactions which can be sought out.

Perceptions are conceived and born in purposeful action. Perceptions instrument feeling. Perceptions are not so much responses to any discrete external "stimuli" as they are to assessed differences. These differences occur and are assessed as constancies develop. When the boundary lines of constancies are crossed in awareness by some situation that appears important or potentially important, then a signal is transmitted that the organism should do something about that situation. So perception involves the continual assessment and re-assessment as ceaseless change goes on, both in the external and internal environments.

Generally, we are in complete ignorance of the significance of a situation unless and until some future action on our part discloses its nature and what its significance is to us. We are then in a position to register the assumption on the basis of which we have acted, to store this in our developing "mind," and gradually to build up a more and more reliable pattern of assumptions or weighted averages by means of which we can more appropriately direct our

choice and behavior to bring about the state of feeling we desire. Gradually, we learn to orient ourselves in relation to what is both possible and potential.

What we attend to in the external or the internal environment are those assessed differences that begin to assume some significance in terms of our feelings. William James, among others, long ago pointed out that "attention" is an intervening variable that itself explains nothing. "Attention" refers to some significance we become aware of because we have learned to sense that it will affect our feeling states in one way or another. A useful phrase to describe this instrumentation of feeling via perception is the colloquial expression "to size up." We are constantly "sizing up" situations, people, sets of symbols, alternative courses of action, etc. As we learn to weigh events and alternatives more successfully, we might say that we develop greater "free will." Obviously where one and only one type of action will aid us, then the role of awareness and consciousness is minimal and action becomes reflexive or habitual.

In this continuous process of "sizing up," of making prognoses concerning what something "is," what its characteristics are, what the probable behavior or probable purposes of other people are, and the like, we judge all new encounters and situations in terms of the up-to-the-now pattern of assumptions which we have found have some pragmatic basis in past experience. Back in 1879, G. H. Lewes noted that "the new object presented to sense, or the new idea presented to thought, must also be soluble in old experiences, be re-cognized as like these, otherwise it will be unperceived, uncomprehended." We continually compare the prognoses of the changing new external and internal events with the pattern of assumptions derived from the past. If we find they conform—that is, if they "work"—then we may either no longer be concerned or have minimal concern. But insofar as they do not work, we must take stock of the situation, reassess it, and make a choice which has some degree of probability concerning its final outcome.

Both the reticular activating system and the cortex make it possible for us to register and store the quality of feeling we have experienced in our continuous transactions. They enable us to build up all manner of constancies—about the characteristics of things, of people, of symbols, of groups and ideologies—that make our appraisals easier and more reliable. We become frustrated when we sense a conflict between the significances we bring to a situation and which have worked in the past but seem to have no correspondence or clear relevance to the emerging situation we face and which requires some decision and action on our part if we are to relieve or enhance our feelings.

All perceiving thus has an anticipatory aspect and the registration or storing

of a perception has an anticipatory quality that we extrapolate in the immediate or more long-time future. Thus, Grey Walter finds that the "expectancy wave" develops in response to a warning stimulus only when a person knows the warning will be followed by a second stimulus requiring an action or decision (19). The detailed work of Soviet physiologists and psychologists on the orienting reflex points to the same conclusion. All expectation is relative to the assumptions we bring to an occasion. It is an obvious fact in everyday life that if we "expect" the dentist's drill or the doctor's probing to hurt us, if we "expect" some person to act in a particular manner, our subsequent reaction is thereby altered. On the other hand, there are numerous instances of men who have been seriously wounded in battle who, in the excitement and urgency of combat, have felt no pain whatsoever. Every perception that is registered seems to involve an extrapolation of some sort of the potential significances of an event or transaction of a certain matrix of experience with significance always referring back basically to its significance for our feelings.

Just as "memories" are registered and stored, so also are other varieties of psychological states imprinted and stored. Complex psychological qualities and patterns described by words like assumptions, purposes, opinions, and values are similarly learned and registered. They become a crucial part of the internal environment, providing human experience with its varied nuances, its ranges, its capacity to judge what is significant. Without the registration of such processes of mentation and feeling, it would be impossible to account for the reality of much of human experience: of intentions, of curiosity, ingenuity and devising; of persistence, ego-involvements, a sense of morality; of the human being as a unique chooser of possibilities.

Such a conception is completely consistent with modern neurophysiology. A prominent neurologist, for example, has written:

A central nervous control is exerted even out to the peripheral sense organs, and acts throughout the entire trajectory of the ascending sensory pathways. This control, which was unknown until a few years ago, appears to be exercised in accordance with internal value systems which themselves are affected by previous as well as concurrent appetites and purposes. Thus the modulation of incoming sensory impulses seems to be based upon expectation, relative significance to self, and so forth. Value systems are incorporated in central nervous mechanisms of reward and punishment, emotional experience and expression, and are accessible to the presumably more objective and depersonalized systems of neo-cortex. This complex set of value systems is built into the chassis, so to speak, and cannot be divorced from either the ascending signals coming in from the outside world, or from the outgoing sensory-control impulses

which can modulate these incoming messages. Evidently the nervous system is continually exercising and refining its control over sensory pathways, just as it has long been known to do in relation to motor performance. Presumably the brain can shape our perceptions more or less as it shapes our comportment (8, p. 91).

Obviously it is because of the registration of such qualities that human experience is so different from that of any other organism in its subtlety, its moods, its appreciations, and its anxieties. Marcel Proust, a particularly keen observer of the well-springs of his own experience, reported that "I write nothing of what I see, nothing at which I arrive by a process of reasoning, or of what I have remembered in the ordinary sense of remembering, but only of what the past brings suddenly to life in the smell, in a sight, in what has, as it were, exploded within me and set the imagination quivering, so that the accompanying joy stirs me to inspiration" (16, p. 410). In similar vein, Albert Einstein said to his biographer that

The most beautiful emotion we can experience is the mystical. It is the source of all true art and science. He to whom the emotion is strange, who can no longer wonder and stand rapt in awe is as good as dead. To know that what is impenetrable to us really exists, manifesting itself as the highest wisdom and most radiant beauty which our dull faculties can comprehend only in their most primitive forms—this knowledge, this feeling is the center of true religiousness. In this sense and only in this sense I belong to the ranks of devoutly religious men (5, p. 284).

As mind and Self develop, behavior becomes infinitely diverse and complex in its quality and range. It is because value systems can become "incorporated in central nervous mechanisms" that any simple pleasure-pain dichotomy or hedonistic theory becomes inadequate to account for a wide range of human behavior. One observes this in the case of mothers who forego many personal gratifications for the welfare of their children, among doctors and priests who give up their rest and comfort for the ill, among soldiers who suffer the hardships of warfare, among martyrs or Buddhist priests and nuns who practice self-immolation, among revolutionary leaders who give up security and worldly pleasure for the sake of their cause. All such behavior seems guided by a desire to achieve the fulfillment of some value system that has become registered.

The "purposes" we learn and intellectualize to ourselves as we act in various situations assume enormous variety both in kind and in degree. But basically the purposes which constitute the intentions we try to fulfill by our actions all seem to derive from the primitive appetitive systems which have become conditioned and refined and which are, furthermore, generally

beyond our intellectual control. This is confirmed over and over in everyday life occurrences and in psychological experiments which show so clearly that a person with a special interest does not and cannot "size things up" intellectually with any impartiality, that he "sees" things as they are colored by his feelings and not simply as they are rationalized by his intellect.

D. SOCIAL PARTICIPATION

It is abundantly clear to anyone concerned with an understanding of human behavior that, as Macmurray expressed it, "the Self exists only in dynamic relation with the Other" (11, p. 17); that "we are not organisms, but persons. The nexus of relations which unites us in a human society is not organic but personal. Human behaviour cannot be understood, but only caricatured, if it is represented as an adaptation to environment" (11, p. 46). Nearly all human experience is in one way or another experience that involves other people. And unless we are among the tiny minority of persons who for some misanthropic reason choose complete isolation as a way of life, we all have a yearning to communicate with others in one form or another, to experience a sense of participation which will give us a sense of mutuality, an opportunity to express our feelings and have them responded to in some manner, and, in the process, have our feelings satisfied and our sense of isolation and insulation reduced.

Frequently we feel rewarded simply by being with others, hearing their voices on the telephone no matter what the content of conversation, joining with them in almost any kind of shared activity that provides the participation we yearn for. We know that even infant monkeys cannot develop into normal adults without participation of some variety with their peers. The phrase "interpersonal relatedness," so common in the literature of social science, often tends to pass over in its implications the warmth, the overtones of feeling, the love that binds so many people together and that can become a cold, anti-septic phrase when applied to family, community, and other human relationships that we regard as the most valuable and cherished we have. Even psychologists have seemed to shy away from underlining the desire to love and to be loved that shines through so much of their own data and that provides, perhaps, the most satisfying feeling a human being can experience. When feeling is left out of any social equation, including the equation of the social engineer or the responsible official planning national policy, it is ignored at great peril and the equation will sooner or later be found "wrong," in the sense that it will not work. Any ideology will eventually wither away if it does not operationally at least adjust itself to accommodate human feelings.

In the normal course of development, the Self is expanded as we become "ego-involved" with more and more situations, individuals, groups, or ideologies which both broaden and solidify our sense of Self and Self-constancy and thereby enhance our basic feeling of satisfaction. The manner in which the Self becomes extended throughout the course of living by learning the norms of some reference groups—with the standards of the group becoming the standards of the individual—has been convincingly demonstrated many times experimentally and is, of course, a familiar enough occurrence in everyday life. Similarly, the many studies of conformity, appeals, and propaganda point to the same conclusion: a person is influenced or becomes ego-involved when he perceives that the standards of a social grouping, a belief, or an ideology can provide him with criteria of judgment and action that will enable him to enrich his sense of worthwhileness, whether the group whose standards and norms he accepts be that of a gang engaged in violence, a monastic order, or some variety of political, national, or social movement. From the point of view of "motivation," all such learned identifications serve as vehicles for the extension and expression of feelings, and the particular vehicles utilized are matters of circumstance and temperament to be understood in terms of an individual life-history. All of them provide the social constancies except for which there could be no sense of Self.

Some years ago when the writer was investigating the reasons for the large Communist protest vote in France and Italy, he visited a predominantly Communist *borgata* (slum area) on the outskirts of Rome. The chief police officer for the district was an exceptionally fine, compassionate man much beloved by those in the *borgata* who brought their troubles to him so that he served informally as judge, priest, and general counsellor. The writer complimented him on the decor of the waiting room outside his office with its new and clean furniture, its framed pictures, its newspapers and magazines, its bouquets of flowers in lovely vases. Then the officer explained why he had fixed the room up as he had. Apparently couples who were at odds with each other or men who were accusing each other of some sort of petty crime used to come in to see him and while they were waiting would frequently get into violent arguments that led to beatings or fisticuffs. In trying to cut down this sort of behavior outside his own office, he said he thought it might work if he had the whole place decorated as nicely as he could afford to make it, thus reminding all his visitors symbolically of the norms of a good and decent society. Since the redecoration there had not been a single instance of undesirable behavior. The writer mentions this illustration for it shows in a nutshell the power of social norms that one knows are appropriate as

guides to action in a particular situation and the violation of which would cause a feeling of distress within the individual who has transgressed.

Apparently ever since the human race began its career on this planet, it has devised ways and means of insuring or enhancing the possibility that the individual could, if not in slavery or prison, experience the value-qualities of feeling that human beings cherish and that make living worthwhile. All manner of organizations and institutions with their rules and regulations have been devised to help guarantee or give expression to the feeling of personal mutuality and the sharing of significances. Rituals, such as those created for baptism, puberty, marriage, or burial, enable a number of people to share the same experience simultaneously, help to bind one person to another, and enrich feeling by deliberately making an event out of what would otherwise be an isolated happening. Such occasions provide people a symbol that allows them to express both their awareness of a situation and their joy or grief, as the case may be, of this awareness. Symbols are created and perpetuated which make wider communication and identification possible; myths develop to give a coherent vision which satisfies until accumulating knowledge corrodes them. All of these social creations—institutions, symbols, and myths—implement the search for commitment and the satisfaction it can bring.

The concept of "culture" itself, from a psychological point of view, can be defined as a relatively stable pattern of common significances which people have learned and which they accept. The term "political culture" which has become part of the vocabulary of the political scientist would, then, refer to a common pattern of significances people have learned and accept that deal with the power and influence structure of a community, nation, or region. The deep and pervading influence of the "cultural patterns" that have been learned with all their norms of behavior is occasionally forgotten, even by the psychologist and social scientist, whose account of modern man sometimes can become naive in its sophistication and its disregard of how much our feelings have become channeled. Thus, for example, Lewis Mumford has pointed out that

If we could recapture the mentality of early peoples, we should probably find that they were, to themselves, simply men who fished or chipped flint or dug as the moment or place might demand. That they should hunt every day or dig every day, confined to a single spot, performing a single job or a single part of a job, could hardly have occurred to them as an imaginable or tolerable mode of life. Even in our times primitive people so despise this form of work that their European exploiters have been forced to use every kind of legal chicane to secure their services (13, p. 102).

Investigations of social discontent, such as riots, uprisings, or revolutions, together with any measures taken to avoid them or calm them, will fall wide of the mark if the feelings of the participants are neglected, if their sense of inferiority and frustration are not recognized, if their pride is violated, or if they feel that they or their aspirations are not understood. For no amount of data collected about the "objective conditions," the poor standards of living, the lack of educational or job opportunities will have real meaning until translated into the human dimension.

E. THE MATRIX OF OUR REALITY WORLDS

Throughout the course of his life, then, an individual is an active participant in the creation of his own mind, the development of his own Self, and, more generally speaking, his own reality world. As the writer has often emphasized, this reality world, composed of the whole complex of learned assumptions brought to an occasion of living when it takes on significance because of them, is the only world a person knows, the world within which he has his being. All we can ever know and be aware of about the activities that envelop us is their significance to us in terms of our reality world.

A person tries from infancy onward to build up for himself a pattern of assumptions that will increase the correspondence between what he perceives in the environment around him and what this environment turns out to be when he acts within it to experience some intended consequence. And the intended consequence derives from the built-in tuning mechanisms of feeling. Generally we try to maintain the continuity and constancy of this reality world at the same time we try to enlarge and expand it, as we must, when we meet frustrations and find our previous assumptions do not work. By means of foresight, curiosity, imagination, and devising we try to improve the range of inclusiveness and the validity of our assumptions as we seek what appear to be new potential satisfactions.

This general accounting of what Whitehead called form and flow seems supported by neurophysiology. Ralph Gerard has stated that

The physiological zero for activity, alertness, vigilance and behavior in general is not at the absolute zero level of somnolence, sleep, inactivity and inattention. It is somewhere between this equilibrium level and the other pole of continued change, adjustment, tension and vigilance. In the adult, too little environmental challenge leads to fatigue, anxiety and finally sleep. Presumably the adult mammal, at least, tends to regulate the physiological neuron reserve at an optimal level of partial activation of neurons, which makes them easily accessible, and with little over-reverberation or over-synchronization, which tends to withdraw them from the pool (12, p. 1952).

The concept of homeostasis, when applied to human motivation, is clearly an inadequate model to account for the essential restlessness characteristic of human behavior.

Throughout this whole process, a person acts as a functional unit because of the vertical functioning of the reticular formation broadly defined which stores the significances of inputs and outputs, filters and regulates them, guides its own organization and reorganization using as its North Star for direction the increasing range and richness of feeling which impels, generates, and sustains more specific purposes over whatever time is required to accomplish them, perhaps a few seconds, perhaps decades. What we call "values" provide the most generally useful compass and standards of worthwhileness and satisfaction, integrating as they do far more cues and significances than can be integrated conceptually. This accounting likewise seems consistent with the interpretations being given by modern neurology. Gerard has also pointed out that

Attention is directed to a considerable extent in terms of goals or "purposes"; so values—perhaps just "significance"—must be "givens" at any time. They have been established by experience, racial or individual, and are related to survival. Outcomes of action, rated "good" or "bad" on such criteria, can reinforce or attenuate future acts—by reasonably understood mechanisms—and so establish a hierarchy of choices embedded in the nervous system (12, p. 1952).

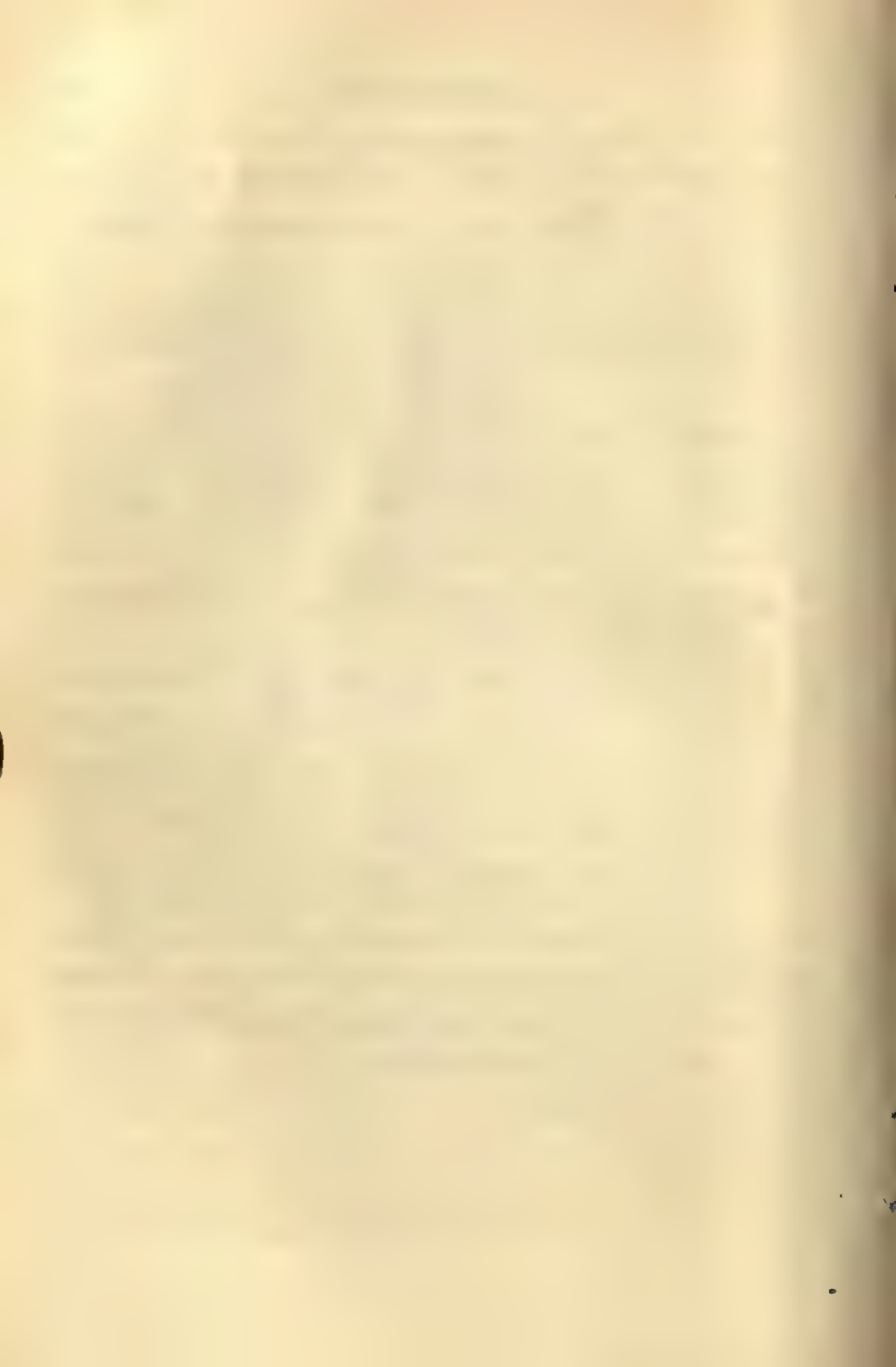
Hence the apparent push from behind and the pull toward the future as we attempt to experience something we have learned to want. John Dewey held that " 'Reasonableness' or intelligence, as 'the perception of the continuities that take action out of its immediateness and isolation into connection with past and future,' acquires more and more an autonomous power of motivation" (18, p. 752).

The apparent self-generated drives, motives, and needs psychologists have delineated and the apparent self-realization and self-actualization of the human being are, as the writer stated at the beginning, accounts that start at "the top" and have been fashioned to describe the full gamut of behavior, often with the implicit premise that they also explain it. What the writer has tried to do here is to indicate that no matter how subtle human feelings are, they are all playing on the same basic built-in neurophysiological appetitive systems the baby uses, instrumented by the vertical organization of the nervous system, in the human endeavor of becoming; a Self striving to maintain its identity by changing itself in the ceaseless effort to enhance the quality, the adequacy, the range, and the validity of its own reality world.

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STIMULUS CHARACTERISTICS AND SPATIAL ENCODING IN SEQUENTIAL SHORT-TERM MEMORY*

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A. INTRODUCTION

In a previous study by Monty, Taub, and Laughery (5), *Ss* were required to tally mentally the number of occurrences of each of several different letters of the alphabet, presented visually in sequences of varying lengths. Seventy-two per cent of the *Ss* indicated that they performed the task by mentally picturing a set of windows, one corresponding to each of the different letters presented. Individual running tallies were then kept in each window, and only the tallies were rehearsed after each presentation of a new letter. Subsequent experiments by Monty, Karsh, and Taub (3, 4) with the same task offered evidence that *Ss* attempt multiple rehearsals following the presentation of each new letter and that these multiple rehearsals tend to improve performance.

With the spatial encoding strategy reported by the *Ss*, one would predict that performance would depend in part on the class of stimuli presented. Specifically, it is hypothesized that a stimulus class possessing a natural or inherent order, such as letters of the alphabet or numbers, should lead to greater proficiency with the keeping-track task than would stimuli not possessing natural order, such as symbols or nonsense forms. There are at least two reasons for such a prediction. First, if the stimuli do not possess a natural order, *Ss* may be forced to rehearse the stimulus names as well as the tallies. Thus, less time would be available for rehearsal of the current state of the information between the presentation of successive stimuli, and an increase in errors should result. In this case, one would predict that as the time between successive stimuli is increased, differences in performance as a function of the class of stimuli employed would decrease. Secondly, Haber (1, 2) presented evidence that the speed of encoding in short-term memory is related

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to accuracy of encoding. Specifically, he suggested that longer latencies and longer durations of encoding produce increased errors in encoding because the short-term memory on which the encoding is based fades quickly. If *Ss* continue to attempt to encode stimuli spatially, one would expect that the time to assign unordered stimuli to their appropriate "windows" prior to rehearsal might exceed the time taken to perform the same task with ordered stimuli. Thus, an increase in the time to encode the information might lead to an increase in error. Further, an increase in time available for rehearsal stemming from an increase in the time between successive stimuli should not effect differences in performance as a function of the stimulus class employed.

The specific purpose of the present experiment then was to determine if the proficiency of *Ss* performing the keeping-track task with plus signs, squares, triangles, and hearts would differ from proficiency of *Ss* performing the task with the letters Q, R, S, and T or the numbers 2, 3, 4, and 5. It was hypothesized that as a result of the lack of a natural order, symbols would lead to poorer performance than would either letters or numbers. Inter-stimulus off-time was manipulated to determine if such differences could be more appropriately attributable to encoding errors or to time available for rehearsal.

B. METHOD

1. *Subjects*

The *Ss* were 120 enlisted men in the U. S. Army, all of whom had received a General-Technical (GT) subtest score of at least 100 on the Army General Classification Test (AGCT).

2. *Apparatus*

The apparatus has been described more fully elsewhere (5). Briefly, *S* was seated in front of a panel, the face of which was positioned two feet from his eyes at a 60° angle below his horizontal line of sight. An Industrial Electronic Engineers, Inc. in-line readout display unit was mounted in the panel. The display unit contained 12 lenses, each etched with one of the stimuli to be presented to *S*. By turning on and off individual lights behind each of the lenses, the stimuli, seen as an outline of light against a dark background, were presented one at a time onto approximately the same location of a 1½- by 1⅞-inch frosted glass surface. All sequences of stimuli and stimulus durations were preprogrammed and controlled by Massey-Dickinson Co. programming modules located in an adjoining room.

3. Procedure

As in the previous experiment, *S*'s task was to observe and tally mentally the number of occurrences of each of four different stimuli (categories) presented sequentially and to record the tally in writing at the end of each sequence.

The *Ss* were randomly assigned to six groups of 20 each, which differed in terms of the duration of the interval between successive stimuli (inter-stimulus off-time) and the stimulus class viewed (letters, numbers, or symbols). Three groups worked at each of two different interstimulus off-times: namely, 2.2 seconds and 4.2 seconds. Stimulus on-time was 0.1 second in each case. Two groups at each off-time viewed sequences of the letters Q, R, S, and T; two viewed the arabic numerals 2, 3, 4, and 5; two viewed the symbols "plus sign," "triangle," "square," and "heart."

Trial Length, defined as the total number of stimuli presented in a sequence irrespective of the category to which they belonged, was included as a within *S*'s variable. All *Ss* were presented with Trial Lengths of eight, 12, 16, and 20 stimuli. To permit assessment of practice effects, a total of 32 trials was presented. Each of the four Trial Lengths was presented twice in random order during each of the first eight trials and twice more in different random order during each of the remaining three blocks of eight trials. The sequence of stimuli within a given trial was chosen at random with the restriction that each category appeared at least once.

Two practice trials were given to insure that *S* understood the task. These trials were followed by 16 experimental trials with a 15-second intertrial interval for recording answers, a 10-minute rest period, and 16 additional experimental trials. A 2500 Hz tone signalled the beginning and end of each trial.

C. RESULTS

Absolute error, defined as the sum of the absolute differences without regard to sign, between the number of stimuli presented in each category and the number reported in each category was used as the measure of performance. For example, if five 2's, three 3's, two 4's, and four 5's were presented and *S* reported seven 2's, three 3's, four 4's, and three 5's, the number of errors for that trial would be two for the 2 category, zero for the 3 category, two for the 4 category, and one for the 5 category, for a total of five.

The absolute error scores for the two equal trial lengths within each block were summed resulting in a single score for each of the four different trial lengths within each of the four blocks. These scores were subjected to an

analysis of variance with Trial Length and Blocks as within S 's variables and Off-Time and Stimulus Class as between S 's variables. The data underlying the significant main effects indicated that, in general, performance varied inversely with Trial Length, $F(3,342) = 262.65$ ($p < .001$), directly with Off-Time, $F(1,114) = 20.11$ ($p < .001$) and the amount of practice or Blocks, $F(3,342) = 24.64$ ($p < .001$), and as a function of the Stimulus Class employed, $F(2,114) = 10.44$ ($p < .001$). Letters and numerals led to about the same level of performance, while performance with symbols was somewhat poorer (mean errors per trial of 1.86, 1.97, and 2.86, respectively).

Several of the interactions also reached statistical significance. The data underlying the significant Trial Length \times Off-Time interaction, $F(3,342) = 13.51$ ($p < .01$), are shown in Figure 1. It can be seen that as interstimulus

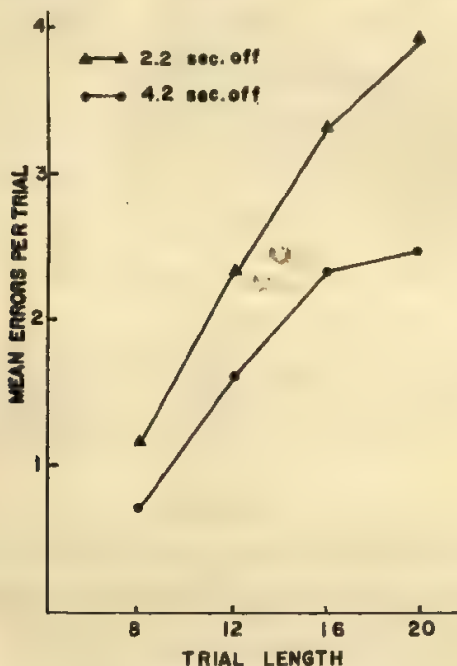


FIGURE 1
MEAN ERRORS PER TRIAL AS A FUNCTION OF TRIAL LENGTH
AND INTERSTIMULUS OFF-TIME

off-time decreased, differences in performance as a function of Trial Length became more pronounced. The data for the Stimulus Class \times Trial Length

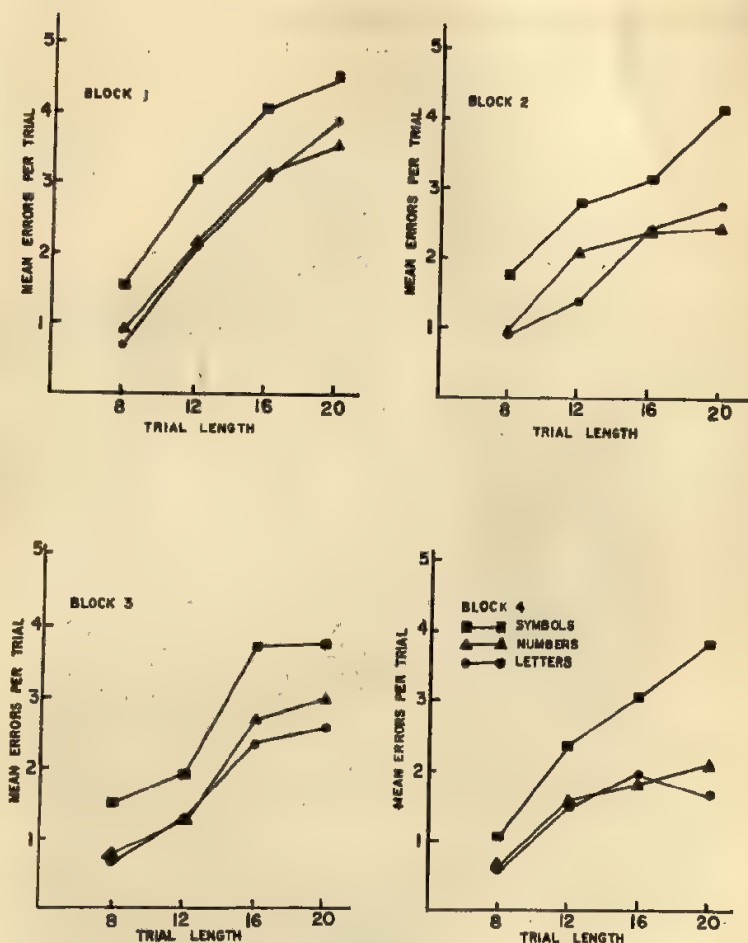


FIGURE 2
MEAN ERRORS PER TRIAL AS A FUNCTION OF BLOCKS, TRIAL
LENGTH, AND STIMULUS CLASS

interaction, $F(6,342) = 2.74$ ($p < .05$), indicate that as the trial length increased performance degraded in a linear fashion, but that the rate of degradation was greater for the symbols than for the numbers or letters. Similarly, the data for the Blocks \times Trial Length interaction indicate that the longer the trial length, the greater the improvement in performance across blocks. These latter two interactions are reflected in the significant Stimulus

Class \times Trial Length \times Blocks interaction, $F(18,1026) = 1.90$ ($p < .05$), represented in Figure 2. It can be seen that the learning effect reflected in the Trial Length \times Blocks interaction is somewhat more pronounced for numbers and letters than for symbols. That is, there is little evidence of learning with symbols regardless of Trial Length. Stated differently, the differences in performance reflected by the Trial Length \times Stimulus Class interaction become more apparent as practice progresses.

D. DISCUSSION

In general, the results of the present study are in agreement with the previous studies by Monty, Taub, and Laughery (5) and Monty, Karsh, and Taub (4). That is, the same general relationships as a function of presentation rate, trial length, and practice are evident in all three studies.

Of greater interest is the observation that symbols led to a higher level of error than did either numbers or letters. This would seem to support the hypothesis that performance can be enhanced by providing Ss with a stimulus class that has a natural or built-in order. An alternate possibility that differences might be due to perceptual factors is not considered tenable owing to the fact that highly familiar, easily recognizable symbols were used. Further, differences between stimulus classes attributable to such factors would be expected to diminish or remain constant rather than increase with practice. As in previous experiments, the role of trial length can be explained as follows: Once an error is made, it is not likely to be corrected at a later time in the trial, particularly if the error itself is rehearsed. Errors then should be cumulative and the longer the trial length, the greater the number of errors to be expected.

The failure of the Stimulus Class \times Off-Time interaction to reach statistical significance would tend to favor the interpretation that the higher level of error accompanying symbols stems from an increase in encoding error rather than from a decrease in time available for multiple rehearsal as a result of having to rehearse both category names and tallies. That is, had the high level of error accompanying the symbols been attributable solely to the time available for rehearsal, then differences between the ordered and nonordered stimuli should have diminished as off-time increased. On the other hand, if differences between the stimulus classes were due primarily to encoding errors, then an increase in off-time would not be expected to compensate for them. Thus, while there is no direct evidence that differences in performance as a function of stimulus class were attributable to differences in speed of encoding, the data of Haber (1, 2), together with evidence presented by Sperling

(6, 7) that memory decays rapidly between the time of stimulation and time of permanent storage, would seem to support this possibility.

Finally, one further point seems worthy of mention. In a previous study by Taub, Monty, and Laughery (8), performance of the keeping-track task (with the letters Q, R, S, and T and a stimulus on-time of 0.1 second) did not change as interstimulus off-time was increased from 1.9 to 3.9 seconds. The authors suggested that performance reached an asymptote with a presentation rate of one letter every 2 seconds. In the present study, however, differences were observed as a function of an increase in interstimulus off-time. Specifically, when the letters Q, R, S, and T were used as stimuli, an interstimulus off-time of 2.2 seconds resulted in a mean of 2.32 errors per trial, and an interstimulus off-time of 4.2 seconds resulted in a mean of 1.40 errors per trial. Thus, if one draws comparisons across studies, it appears that there is either a plateau in performance between rates of presentation of one letter every 2 seconds and one letter every 4 seconds, followed by further improvement in performance beyond rates of one letter every 4 seconds, or, possibly, an inverted U function exists between these rates. Clearly, further research is warranted to examine performance as a function of interstimulus off-time in more detail.

E. SUMMARY

Performance of the keeping-track task described by Monty, Taub, and Laughery (5) was examined as a function of the class of stimuli employed. It was found that a stimulus class possessing a natural or built-in order led to better performance than did a stimulus class lacking such order. It was suggested that the differences stem from the speed with which Ss complete encoding of the information to be remembered rather than from the time available for rehearsal between successive stimuli.

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THE MANIPULATION OF SELF-DISCLOSURE*¹

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A. INTRODUCTION

The results of self-disclosure by individuals have long been employed to make predictions of future performance. The psychiatric interview, the employment interview, and the orientation session prior to therapy are but a few of the many instances where material disclosed by an individual is used to make important decisions about the individual. Although self-disclosing behavior is an important area of human behavior, psychologists, for the most part, have not investigated procedures for facilitating the process of self-disclosure. The concern has centered around techniques on the part of the therapist or interviewer, such as "probes" and "leads." There has been little apparent concern with exploring some of the variables, situational and personal, playing a part in self-disclosing behavior.

Psychologists have not been entirely unmindful of this area of behavior. Jourard in an extensive series of investigations has studied, for example, the predictive value of self-disclosure scores in an academic setting (5), as well as factors underlying self-disclosure (6). His interest in this area, however, has not centered around the control and manipulation of subject's behavior in self-disclosing situations. Himmelstein and Kimbrough (4), in a study of self-introductions in a classroom situation, observed that the order in which the speaker appeared with relation to other speakers was significantly related to the amount of material disclosed. This study, however, made no attempt to control the situational variables and was not concerned with the experimental manipulation of subject's behavior.

The purpose of the present study is an attempt to manipulate self-disclosing behavior in a group setting. The study also is an effort to determine, as Blake and Mouton (2) suggest, if submissive subjects are more susceptible than are ascendant subjects to such manipulation.

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¹ This study is based on a Master's thesis performed by the senior author under the supervision of the second author at New Mexico State University. Correspondence regarding this study should be directed to the second author.

This study is cast in the format of a study of conformity, wherein conformity is defined as "a specific action that is identical to responses by other persons present in the experimental situation" (2, p. 226). As in most conformity studies, the "other persons present" are confederates of the investigator who behave in a prearranged manner. It is hypothesized that naive subjects will conform to standards of behavior presented by confederates, and will disclose more about the self when the confederates do so, and will be reticent about the self when the confederates display this behavior. A second hypothesis is that resistance to these background influences is related to the degree of submissiveness of the subjects.

B. PROCEDURE

1. *Subjects*

Forty-eight male students, enrolled in the introductory psychology and child psychology courses at New Mexico State University, served as subjects for the experiment. All were white Americans, between the ages of 17 and 25.

2. *Measure of Submission*

The Allport A-S Reaction Study (1) was employed to measure the subjects' placement along the ascendancy-submission continuum. This instrument was selected because previous research (3, 7) had successfully demonstrated that submissive individuals tend to be more conforming than are ascendant individuals to the behavior of confederates in a group setting.

In the present study, 24 ascendant and 24 submissive subjects were randomly selected for the experimental procedure. The ascendant subjects had decile scores between 1 and 3; the submissive subjects had decile scores of 9 and 10. The administration of the study was conducted in group sessions after class hours and was presented to the subjects as a complete study, in no way related to the second phase of the study.

3. *Experimental Station*

Two experimental background groups were used in this investigation. In one group, confederates were instructed to disclose eight items of information about the self in a prearranged manner. For purposes of identification, this group is labelled the "much information" group. In the second group, confederates were instructed to disclose three prearranged items about the self. This group is labelled the "little information" group. In the "much information" condition, the confederates disclosed the following information about the self: name, age, year in school, academic major, academic minor, marital

status, home town, and chosen profession. In the "little information" situation, confederates related only the first three items.

Subjects were randomly assigned within A-S groups to one of the two background groups, forming an Ascendant-"Much" and Ascendant-"Little" group, and Submissive-"Much" and Submissive-"Little" groups.

Each subject reported individually for his participation in the study. Two confederates who were unfamiliar to the subject were presented as additional subjects for the experiment which would follow. First, however, subjects were asked to introduce themselves, with the confederates preceding the subject. These introductions were taped as was the "experiment," which consisted of a "Twenty-Questions" game.

4. *The Dependent Variable*

The measure of the amount of material disclosed was the number of items about the self revealed by the subject in the self-introduction. A rank-order correlation between two independent raters, one naive about the purpose of the experiment, resulted in a rho of .99. Each rater scored the material on the tape, giving one point for each item disclosed in the introduction.

C. RESULTS AND DISCUSSION

Table 1 summarizes the means and standard deviations obtained by the two personality groups under the two background conditions of "Much" and "Little" Information. It is apparent that both ascendant and submissive subjects tend to conform to the confederates' behavior in self-disclosing and that there is a nonsignificant difference between the two groups divided on the basis of A-S scores.

TABLE 1
MEANS, STANDARD DEVIATIONS, AND TESTS OF SIGNIFICANCE OF THE
AMOUNT OF INFORMATION DISCLOSED

Variable	Personality designation				<i>t</i>	<i>p</i>
	Ascendant		Submissive			
	Mean	<i>SD</i>	Mean	<i>SD</i>		
Much information	6.00	1.00	6.25	1.09	.4472	n.s.
Little information	3.13	0.33	3.13	0.60	0.0	n.s.
<i>t</i>	7.22		6.65			
<i>p</i>	<.001		<.001			

Table 2 presents the results of an analysis of variance of the scores for amount of information revealed. Significant main effects for background ($p < .001$) were obtained, but not for Ascendant-Submissive or the interaction between trait grouping and background.

TABLE 2
ANALYSIS OF VARIANCE OF AMOUNT OF MATERIAL DISCLOSED BY
TWO PERSONALITY GROUPS IN TWO BACKGROUND SITUATIONS

Source	df	MS	F
Personality (A)	1	.128	.169*
Background (B)	1	72.00	94.862
A \times B	1	.116	
Within	28	.759	

* $p < .001$.

The results indicate that subjects reveal more about themselves when others are revealing more and, conversely, reveal less when others do so. The hypothesis that naive subjects will conform to standards presented by the responses by other persons present is thus supported for self-disclosing behavior. It was thought that ascendant subjects might be the more resistant to the "Asch effect," but this hypothesis is not supported by the data. It would appear that situational variables predominate in this type of situation in determining the amount of material that an individual will disclose about the self. Personality variables, as measured by the A-S Reaction study, do not play a significant role in determining the amount of material disclosed in the experimental situation.

Since this study employed material relevant to a university setting and is concerned with relatively innocuous items about the self, it leaves unanswered the problem of the role of personality in revealing highly personal information (sexual conflicts, family problems, emotional problems, etc.). Additional studies are needed to determine to what extent hearing others disclose very personal information will stimulate subjects to do so to the same extent. Other questions relevant to the Asch conformity situation, such as the size of the group and the status of the confederates as variables affecting the subject's behavior, would also require additional studies.

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"INFLUENCE OF PERSONALITY TYPE ON DRUG RESPONSE": A CRITICAL REPLY*

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Sarwer-Foner (13, 14), after studying paradoxical drug reactions, advanced the hypothesis that "the typical pharmacological effect (of the tranquilizing drug) chemically removes or interferes with activities used by the patient as major defenses against unconscious underlying conflicts" (14, p. 530). More specifically, persons who characteristically are outgoing and physically interactive with their environment will respond with panic, agitation, and anxiety to sedative-hypnotic and motor-inhibiting effects of drugs. This hypothesis has lent impetus to recent research (4) focusing on the relations between personality type and differential response to psychotropic drugs. The tremendous and continually increasing number of patients prescribed such agents dictates further relevant investigations. Such studies would explicate the relationships between personality type and response to a variety of psychotropic drugs, and would provide guidelines for individualizing drug administration according to nosological grouping conjointly with personality characteristics. The existing studies, because of methodological shortcomings, do not provide an adequate model or basis for such guidelines. This article constitutes a critical reply to the most recent study (3), and focuses on the methodological weaknesses that led to erroneous conclusions. It is hoped that this reply might aid in the formulation of future studies in this as yet nascent area in building substantive knowledge from a sounder scientific base.

Frostad *et al.* (3), attempting to relate personality type to drug response, selected 60 young adult male subjects (30 "action-oriented," 30 "nonaction-oriented") on the basis of the Institute for Personality and Ability Testing (IPAT) 16 Personality Factor Questionnaire (2). These subjects were subdivided by means of the Manifest Anxiety Scale (MAS) into "low" (scores of < 10) and "high" (scores of 10 and above) anxiety groups. Following administration of diazepam (Valium), total dosage equalled 60 mg per subject, the subjects were evaluated under four experimental conditions: unfamiliarity of surroundings, threat in the form of electric shock, uncer-

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tainty, and interference in the form of distracting noises. The effects of these conditions were assessed by changes in skin resistance, surface electromyography, and ability to solve math problems. The results were analyzed by means of individual *t*-tests.

Frostad *et al.* predicted that "action-oriented people respond differently to diazepam than do nonaction-oriented people" (3, p. 1153). The rationale for this nonspecific prediction was based on a previous observation (8) of paradoxical reactions (increase in muscle tension and decrease in skin resistance) to diazepam in one-third ($N = 6$) of their subjects. In retrospect, these subjects were found to be differentiated from the subjects experiencing normal reactions to Valium by various personality parameters as measured by the IPAT 16 Personality Factor Questionnaire. Specifically, the subjects manifesting paradoxical reactions obtained higher mean scores on both the H (shy *vs.* adventuresome) and M (practical *vs.* imaginative) scales, and lower mean scores on the G (expedient *vs.* conscientious) scale.

Frostad *et al.* assumed the significant personality differences (three of 16 scales) to be the underlying factors accounting for the paradoxical drug reactions. The next logical step, prior to initiating the present study, would have been cross-validating the paradoxical reaction finding with a second larger sample. Successful cross-validation would allow predictions from a sounder position: i.e., this procedure would support the contention that these personality factors are related to differential drug response in a meaningful manner rather than a chance occurrence. For example, it would be equally as likely that action-oriented and nonaction-oriented subjects would obtain reliably different scores on the Q_1 scale (conservative *vs.* experimenting), which would appear closely related to the H, G, and M scales. In spite of the authors' recommendations for replication studies, cut-off points on the H, G, and M scales were not provided. Without information regarding cut-off points, ranges, and standard deviations of the two groups' scores on these three criterion scales, replication is difficult.

Taylor (16), in her normative study of comparable subjects, designated MAS scores of 3 to 11 as "low anxiety" and 25 to 37 as "high anxiety." Sampson and Bindra (10) emphasized that MAS scores of 19 to 33 represent subjects likely to be classified as anxious by clinical criteria, with scores below these not representing significant manifest anxiety. The low anxiety group of Frostad *et al.* corresponds to Taylor's recommended range. On the other hand, selection of a high anxiety group by, apparently, a median split provides speculation that these authors' high anxiety group contains many subjects of low or moderate anxiety. It is likely that Frostad's study contains no high anxiety group, but differentiates between low and normal anxiety.

In support of this speculation, the subjects were "normals," a population whose mean scores would be expected to be relatively low with a distribution skewed toward the low end of the continuum. Further, statistical analysis (*t*-test for means) would determine if these two groups differ significantly in mean anxiety levels. Significant differences between these two groups' mean anxiety levels could have been additionally supported by analysis of the IPAT O (placid *vs.* apprehensive) and Q₄ (tense *vs.* relaxed) scales. It is difficult to avoid the conclusion that the criteria for low and high anxiety groups significantly affected the lack of reliable results relative to the anxiety dimension.

The grounds for choice of the four experimental conditions are not clear, nor is it clear why any such conditions are necessary. While it is assumed that these individual conditions constitute four distinct sets of experimental circumstances, which would produce differential effects, it would seem the rationale for choice of these conditions, collectively, related to their anxiety-arousal potential. However, this potential is related to the situational context under which the conditions are applied. Previous studies (5, 6) have shown reliably that electric shock produces anxiety or, more accurately, transient disturbances in various physiological components. The effects of temporary unfamiliarity of surroundings as well as uncertainty [described as "implied under situations of (1) unfamiliarity and (2) threat" (3, p. 1154)] on anxiety arousal, on the other hand, seems more variable. Moreover, the disrupting effects of "distracting noises" (stressor) on mental set is dependent on a person's ego involvement in the task (7, 11, 12): i.e., the degree to which interference is anxiety-provoking is related to the person's perception that poor performance on the task would lower self-esteem. The effects of diazepam on muscle tension would also seem to be quite variable, dependent primarily on whether the subjects, in relation to musculature, are "visceral-responders" or "skeletal-responders."¹ The relations between the two dichotomized variables, "action *vs.* non-action oriented" and "visceral *vs.* skeletal" responders, have not been explicated.

As to their measurements, the authors state "the records of the GSR as well as EMG recordings were taken at the same six intervals from the continuous recordings" (3, p. 1155). The points at which the assessments were made are not specified. The differential effects of the four conditions, therefore, are not clear. It would also be of great interest, in regard to the GSR, to know whether the measurement involved changes in basal GSR, latency time, or recruitment times. It is curious that no affective assessments were

¹ Personal communication from J. E. Snell, 1965.

made, especially since (a) one of the most reliable anxiety measures is self-description, and (b) the main hypothesis tested was that diazepam would so interfere with the "action-oriented" subjects' characteristic interaction with their environment as to produce anxiety. Any number of self-report instruments, check lists, are available for quantification of affective changes (e.g., Clyde Mood Scale, IPAT Anxiety Scale, Scheier and Cattell 8-Parallel Form).

One of the most crucial methodological limitations is in the analysis of the results, as individual *t*-tests are used for determining differences between group means (e.g., action-oriented diazepam *vs.* action-oriented placebo groups) instead of an analysis of variance. Analysis of variance accounts for the sample's total variance, whereas multiple individual *t*-tests assume a greater risk that significant values found are spurious. Failure to utilize analysis of variance creates difficulties in drawing valid conclusions from the data and explaining these in terms of theoretical expectations. The authors obviously had such difficulties.

The necessity for obtaining predrug physiological and cognitive performance measures is obvious. Base line measures are crucial for several reasons. First, recent studies (9) have shown that, while a person may describe himself as anxious, his GSR under threatening experimental conditions may react in an opposite manner. Second, equal ability at problem solving is assumed for all groups, with observed differences being attributed to the interfering or dampening effects of diazepam. Without predrug measures of group performance on math problems, this is an unwarranted assumption. Group differences posited to be related to drug effects may equally as well represent native differences in problem-solving abilities. Third, persons vary in somatic response to anxiety, primarily by visceral or motor muscle activation. Lacking a measure of self-report for muscle tension, the muscle tension reducing properties of diazepam might be overlooked completely in visceral responders and incorrectly evaluated in motor responders (by present methodology).

The authors conclude that "diazepam raises the level of skin resistance in normal subjects" (3, p. 1157), an indication that it lowers the level of anxiety. They conclude further that "diazepam in general lowers the level of intellectual performance in these subjects" (3, p. 1157); and "effects of electric shock on performance of math problems appear negligible," "differences in Math A & B (with and without shock) were due to learning and there is no differential effect relative to drug condition or personality type" (3, p. 1158). None of these conclusions is warranted, or supportable, by their

data, because of deficiencies in research design. That is, neither changes in skin resistance nor changes in intellectual performance were measured because of the lack of predrug base line measures. In regard to the effects of electric shock, inspection of Tables 3 and 4 (3, p. 1156), which present results of both math tests, reveals that generally higher scores were obtained from subjects without threat of electric shock. Since gross differences are apparent for mean scores for the two conditions, a simple test for the effects of shock on problem-solving ability could be performed (which was not carried out by the authors), assuming equivalency of difficulty for both math forms (not stated) and controls for practice effects (rather than learning, as the authors state). With these factors controlled, differences found in mean overall scores between the two math forms might reasonably be attributed to shock.

Due to the statistical analysis used, the authors find it necessary to ask, first, what is MAS, and then to reinterpret the MAS as an index of compliance rather than as an anxiety measure. Voluminous research (1) has established this instrument to be a reliable measure of anxiety, or the characteristic amount of anxiety perceived by the subject. Anxiety trait (characterological in nature), resulting from early frustrating experiences, should be differentiated from anxiety state, or temporary physiological changes, effected by experimental conditions or interpersonal situations, perceived as ego-threatening (15).

Thus far, the present author has focused on a description of the study critiqued and on its methodological weaknesses point by point. While the criticisms have implied changes that would yield more valid results and conclusions, it seems appropriate, prior to concluding, to indicate explicitly how the research design might be strengthened. The initial problem involves selection criteria for the two personality types. Following cross-validation of the paradoxical drug reaction finding on a large sample, the subjects might be selected on the basis of personality variables that are meaningfully related to drug responses (in this case, IPAT parameters). The groups would be subdivided by anxiety, preferably following Taylor's and Sampson and Bindra's criteria, or by use of upper and lower quartile scores, into low and high anxiety groups. The modalities evaluated may be selected from a vast number (e.g., EMG, GSR, math problems), but should include some self report of affectivity. A 2×2 analysis of variance, with personality type and anxiety levels comprising the two main effects for each of the evaluations, would provide the most powerful statistical technique for the analysis of results. The total analysis would involve two sets of analyses of variance, the initial set involving predrug base line measurements for each of the evaluation modalities.

Following these analyses, the drug effects would be evaluated by administering diazepam to each of the four groups followed by retesting on each of the measures. Inclusion of a placebo would be accomplished by dividing each of the four groups (action-oriented, high anxiety; action-oriented, low anxiety; nonaction-oriented, high anxiety; nonaction-oriented, low anxiety) into comparable groups, with diazepam being administered to one-half of each group, and placebo administered to the other members of each group. Use of a placebo would involve a $2 \times 2 \times 2$ analysis of variance, with drug condition constituting the third main effect. The placebo group would necessitate an increased number of subjects, since at least 10 subjects should be placed in each cell. However, the additional expense would be offset by the increase in predictive power. Use of a placebo, for example, would allow differences observed for the drug effect to be attributed to pharmacological action as opposed to the experimenter-subject relationship.

In addition to the analysis of results, drug side effects should also be subjected to an analysis of variance. In the present study, subjects are used in more than one cell (group), making it difficult to determine the proportion of drug side effects which is accounted for by each of the main effects (personality or anxiety). Side effects might be effectively treated for statistical analysis by ranking in order of decreasing seriousness, with numerical weights assigned to each rank. Analysis would be in terms of mean seriousness of side effects for the various groups, rather than merely being tabularized in terms of percentages, as is presently done.

In summary, the authors proceed from a very sound and exciting theoretical hypothesis. As has been indicated, methodological shortcomings seriously curtail drawing firm conclusions regarding the relation of drug response and personality type which would foster future research. The main conclusion to be drawn from this investigation is that the Sarwer-Foner hypothesis urgently awaits experimental confirmation. It is hoped that this reply will alert formulators of future experiments involving large expenditures of professional time and expense to the necessity of a rigorous research design.

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EFFECTS OF DIFFERENT CONDITIONING SCHEDULES BASED ON VISUAL AND ACOUSTIC CONDITIONED STIMULUS ON AVOIDANCE LEARNING OF TWO STRAINS OF MICE* ¹

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A. INTRODUCTION

A considerable amount of literature shows that conditioned stimulus (CS) intensity has a marked effect upon learning (15). The effect of CS intensity has been interpreted in terms of a "contrast phenomenon" (14). It was suggested that learning to respond to a stimulus always involves a discrimination between the situation with the CS present and the situation with the CS absent (14). This interpretation implies that the association of two different stimuli elicits stronger responses than does a single stimulus (6, 13). Experiments performed on avoidance learning also lead to the same conclusion.

During the course of previous experiments, it was found that different strains of inbred mice subjected to avoidance conditioning reacted in very different ways to a CS consisting of a light (3). In the present study the writer wanted to assess whether the avoidance responding was enhanced by the combination of light and sound stimuli. Mice belonging to two different strains were also conditioned to a visual or to an acoustic stimulus. The effects of pretraining with one type of CS (i.e., light or buzzer) on the performance during a later session in which a different CS was employed were also analyzed.

B. METHOD

The Ss were 48 DBA/2J and 36 CBA mice from the Jackson Laboratory, males, 20-25 grams. Eight automated shuttle-box devices previously described were used (2). The apparatus consisted of a rectangular plexiglas box divided into two equal compartments connected by a small opening through

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a black partition. The floor consisted of stainless steel rods spaced .4 cm apart. When a buzzer was used as the CS, it preceded the unconditioned stimulus (US) by five seconds but did not overlap with it (buzzer delay, Bd). When a light was used as CS, a lamp (10 watts) was lighted in the appropriate compartment. The light preceded the US by five seconds and did not overlap with it (delay stimulus, Ld). In other experiments the light preceded by five seconds the onset of the US and overlapped with it for 25 seconds (simultaneous stimulus, Ls). When a combination of two stimuli was used (light and buzzer, Ld and Bd), the onset of the stimuli was simultaneous and neither of them overlapped with the US. Finally, in a further group of experiments, mice were subjected to sessions divided into two halves: in the first half the CS consisted of a buzzer (Bd) or of a light (Ld or Ls); in the second half the opposite schedule was used. These sessions are called L/B or B/L.

With all types of conditioning mice could avoid the US (continuous shock through the grid floor, 1.5 ma, scrambled through a selenium rectifier) by running into the adjacent compartment within five seconds after the onset of the CS. The intertrial interval was 30 seconds. Spontaneous crossings were punished and recorded as intertrial responses. Each group consisted of eight mice and was used only once. Except as noted, all statistical comparisons are based on analysis of variance.

C. RESULTS

1. *Performance of CBA and DBA/2J Mice Trained by Using a Light or a Buzzer as CS*

In order to assess the performance of the two strains of mice when different types of CS were used, CBA and DBA/2J mice were given five sessions of 100 trials each separated by 24 hours. Figure 1 shows the performance of different groups of mice trained by using a light (Ls) or a buzzer (Bd) as CS.

With a "delay" stimulus, striking differences were observed in the two strains depending on whether Ld or Bd were used (see Table 1). The performance of both CBA and DBA/2J was lower during the Ld sessions than when a buzzer was used. However DBA/2J mice performed at a higher level ($F = 8.1$, $p < .01$) under the Ld CS than did CBA mice.

When the light was used as simultaneous stimulus (Ls, Table 1), a sharper difference appeared between the two strains. The performance of DBA/2J mice was much higher than that of CBA mice and attained a final level (62.1 per cent during the fifth session) similar to that reached,

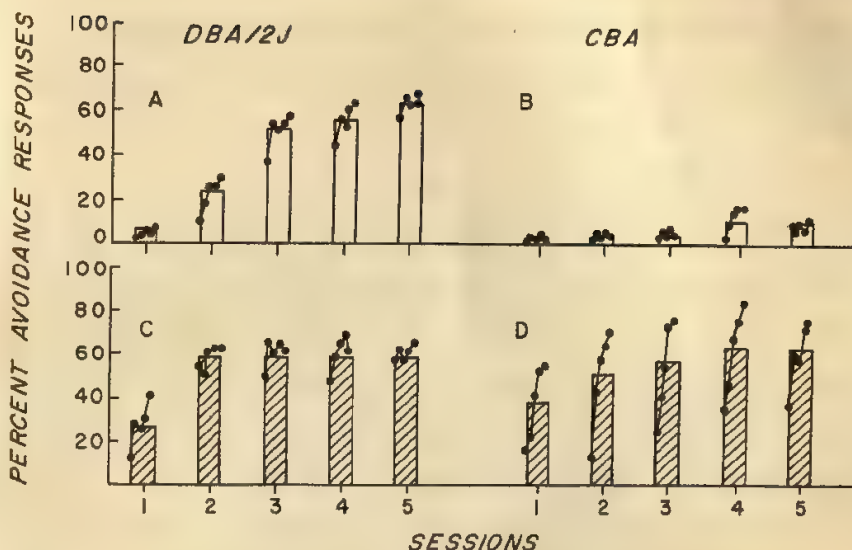


FIGURE 1
PERFORMANCE OF DBA/2J AND CBA MICE TRAINED WITH DIFFERENT
CONDITIONED STIMULUS

A = DBA/2J, CS = light (simultaneous); B = DBA/2J, CS = buzzer (delay); C = CBA, CS = light (simultaneous); and D = CBA, CS = buzzer (delay). All groups were given five sessions of 100 trials each separated by 24 hours. The curve of acquisition within each session is represented by the mean avoidance responses (per cent) calculated in five blocks of 20 trials each.

by the same strain, during the Bd sessions (59.8 per cent). The highest performance attained by CBA mice was much lower (10.1 per cent, fifth session) than that attained by DBA/2J mice during the Ls sessions ($p < .01$). During the sessions in which the buzzer was used as CS, the overall performance did not differ between DBA/2J and CBA mice ($p > .05$). However,

TABLE 1
PERFORMANCE OF CBA AND DBA/2J MICE SUBJECTED TO DIFFERENT
TRAINING SCHEDULES

Strain	Type of CS used			
	Bd	Ld	Ls	Ld + Bd
CBA ^a	52.9 ± 5.0	1.0 ± 0.9	6.6 ± 0.6	64.6 ± 5.1
DBA/2J ^b	53.5 ± 4.1	11.2 ± 1.3	43.0 ± 2.7	73.8 ± 3.9

Note: A light (simultaneous, Ls, or delay, Ld) and a buzzer (Bd) were used as CS. The numbers represent the mean per cent avoidance responses (\pm SE) calculated in five sessions of 100 trials each.

^a Bd > Ld ($F = 8.14$, $p < .01$); Ld + Bd > Bd ($F = 6.51$, $p < .01$).

^b Bd > Ld ($F = 7.86$, $p < .01$); Ld + Bd > Bd ($F = 5.80$, $p < .01$).

when the performance within each session is analyzed, it appears that only a slight decrement is present in DBA/2J mice between the performance observed during the last 20 trials of a given session and that during the first 20 trials of the following one. This decrement is much higher in CBA mice and therefore steeper acquisition curves are observed within each session in CBA than in DBA/2J mice (see Figure 1).

These results could just show that the strain CBA did not acquire the conditioning when a light was used as CS. The mice, however, were not blind, and avoided jumping of a platform when its level was too high. That mice were not blind is indicated also by the following results showing that an association of both stimuli (Ld + Bd) enhanced, in the two groups of mice, the performance in comparison to that observed during the Bd and Ld sessions alone. The mean per cent avoidance responses during five sessions were, in the Ld + Bd group, 64.6 in the CBA (Bd = 52.9) and 73.8 in the DBA/2J mice (Bd = 53.5), respectively (see Table 1).

2. Performance of DBA/2J and CBA Mice During Sessions Divided into Two Halves in Which Different CS Were Used

In this experiment mice were given five sessions of 200 trials each (interval 24 hours) in which the CS was a light (or a buzzer) during the first 100 trials and a buzzer (or a light) during the second 100 trials (Ld/Bd or Bd/Ld). When CBA mice were tested under the Ld/Bd schedule (Table 2), the performance during the Ld half of the session did not significantly differ ($F = 0.64$, $p > .05$) from that previously observed in the Ld group (see Table 1). During the Bd half of the session not only was the level of avoidance responses much higher ($F = 5.91$, $p < .01$) than that observed in the Bd group (Table 1) or in the Ld + Bd group ($F = 6.76$, $p < .01$), but also from session two to five no decrement of the performance was evident between the last 20 trials of a given session and the first 20 trials of the following one (see Figure 2). The mean per cent avoidance responses during the five Bd halves of the sessions was 75.6.

The performance of CBA mice given Bd/Ld sessions (see Table 2) did not differ ($F = 0.46$, $p > .05$) during the Bd or Ld half-sessions from that observed in the Bd or Ld groups, respectively (see Table 1). Finally, in a further experiment, DBA/2J mice were given five Ld/Bd or Bd/Ld sessions (see Table 2). The performance of this strain during the Ld half of the sessions was not different ($p > .05$) from that during the Ld sessions (see Table 1) regardless of whether the Ld half of the session preceded (Ld/Bd) or followed (Bd/Ld) the Bd half of the session. In the Ld/Bd group the per-

TABLE 2
PERFORMANCE OF CBA AND DBA 2J MICE SUBJECTED TO DIFFERENT TRAINING SCHEDULES

Series	Type of CS used							
	Ld Bd		Bd Ld		Ld Bd		Bd/Ld	
	Ld	Bd	Bd	Ld	Ld	Bd	Bd	Ld
CBA	1.2 \pm .02	5.4 \pm 1.3	5.0 \pm 4.0	1.1 \pm .04				
DBA 2J	10.4 \pm 1.2	60.3 \pm 2.1	42.5 \pm 1.9	10.1 \pm 2.0	44.4 \pm 3.1	62.3 \pm 5.1	49.5 \pm 3.5	44.3 \pm 2.7

Note. A light and a buzzer were used as CS as defined. Ld, Bd or combinations. Ld, means: The L, B or B L sessions were composed by two halves of 100 trials each; the CS was L or B during the first 100 trials and B or L during the second 100 trials. The numbers indicate the mean per cent avoidance responses \pm SE, calculated during five sessions of 100 trials each (intervalled by 24 hours).

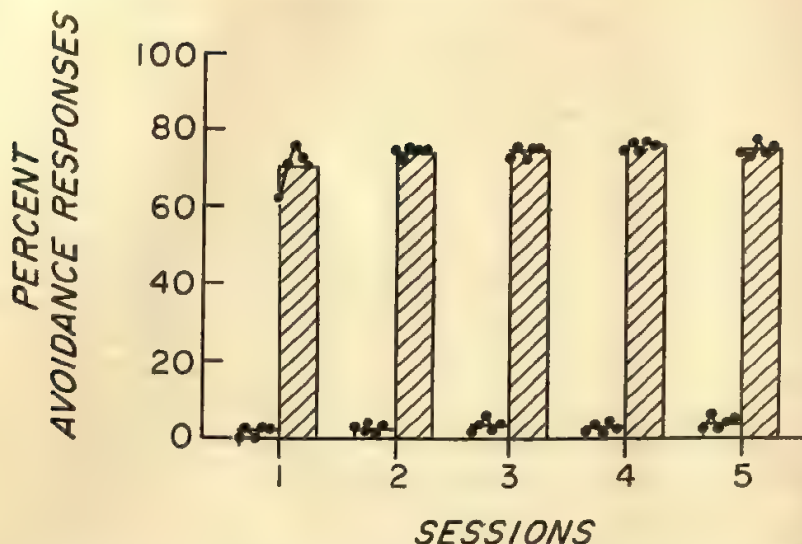


FIGURE 2

PERFORMANCE OF CBA MICE TRAINED WITH DIFFERENT CONDITIONED STIMULUS

CBA mice were given five sessions of 200 trials each separated by 24 hours. The CS was a light (delay) during the first 100 trials and a buzzer (delay) during the second half of each session. The curve of acquisition within each session is represented by the mean per cent avoidance responses calculated in five blocks of 20 trials each.

formance during the Bd half of the session was slightly higher ($F = 3.81$, $p < .05$) than in the Bd group (Table 1). In the Bd/Ld group instead the performance during the Bd half of the session was similar to that of the Bd group (see Table 1) or that in the Bd half of the session of the Ld/Bd group.

As DBA/2J mice performed much better when a simultaneous light was used as CS, in an additional experiment two groups of mice were given five Ls/Bd or Bd/Ls sessions: i.e., by using the light as simultaneous CS and the buzzer as delay CS (see Table 2). In this case the performance during the Ls half of the sessions was higher than in the previous experiment. By this procedure no difference ($F = 0.18$, $p > .05$) was observed between the performance in the Ls half of the sessions and that of the Ls group regardless of whether the Ls half of the sessions preceded (Ls/Bd) or followed (Bd/Ls) the Bd half of the sessions. Similarly to the previous experiment, the performance of the Ls/Bd group during the Bd half of the sessions (see Table 2) was higher ($F = 3.0$, $p < .05$) than that of the Bd group (see Table 1).

In an additional experiment a group of CBA mice was given five sessions

of 200 trials each (separated by 24 hours) in which the US alone was used during the first 100 trials (CS absent), while in the second half of the session the buzzer served as CS. The mean per cent avoidance responses during the five Bd halves of the session (50.8) were not different from those of the Bd group ($F = 0.77, p > .05$), but were significantly lower than the level observed in the Bd half of the sessions of the Ls/Bd group ($F = 4.98, p < .01$).

D. DISCUSSION

The results reported above can be explained as due to a summation of the light and buzzer stimuli. A simultaneous summation when both stimuli are combined, or a successive temporal summation during the Ld/Bd sessions, is understandable in the DBA/2J mice. The problem, however, is more complex in the strain CBA. In this case the level of performance is such a low one under the light (1.0 per cent with Ld) that an increase from a 52.9 per cent level (Bd group) to 75.6 (Bd half of the session in the Ld/Bd group) seems even more striking. This indicates that a stimulus, which had no power on its own right, exerted a very dramatic influence on another stimulus when conjoined with it either simultaneously or sequentially.

It was reported that a previous experience with shock could sensitize animals to the acquisition of a conditioned emotional response (4). It has also been shown that a prior aspecific experience may facilitate the performance when the animals are later tested into the learning situation (5). During the present experiments, however, a previous experience to the shock did not enhance the responding when the buzzer was later used, indicating that mice were not "warmed up" by the previous training with the US alone. It is therefore evident that the summation or potentiation effect is specifically induced by the light stimulus. It is problematic to state whether a simple potentiation occurred in the sequence Ld/Bd in absence of learning or whether some element of learning was involved with respect to the light CS. This second hypothesis could then involve the following: that the absence of learning for the light stimulus might be explained, in CBA mice, because of a form of "inhibition" or "repression." On the other hand, the abrupt high level of performance observed in the Ld/Bd group during the first trials of the Bd half of the sessions (see Figure 2), in comparison to the Bd group (see Figure 1), might suggest a form of latent learning. In this regard it is interesting to recall that in a recent paper it was reported that naive mice subjected to uninterrupted avoidance sessions performed during the test at a very low level. The injection of amphetamine or a period of rest was followed by

a high performance indicating that learning, even if hidden by a form of internal inhibition, took place during the uninterrupted session (1, 12).

During the present experiment mice given a session during which a buzzer was used as CS did not show an enhanced performance in a subsequent session in which the CS consisted of a light (B/L groups) in comparison to the animals trained with the light alone. It appears therefore that a potentiation occurs in the sequence Ld/Bd, but not in the sequence Bd/Ld. The reasons for this difference are not clear.

Results suggesting a conditioned inhibition of avoidance responding have been reported by Konorski (9, 11). It was later shown that a stimulus may act as an inhibitor of another CS (16). The other aspect of the problem is represented by the finding that the results show an increased responding due to a combination of different CS. Findings showing an inhibition or a potentiation of neuronal reflexes have been known since the classic experiments of Magoun (10). The role of the reticular formation on these excitatory and inhibitory processes has been widely discussed by French (7). The present findings underline the existence of these factors also in learning and show the importance that associative processes exert on conditioning and learning. It is interesting, in this regard, to recall a statement made by William James in 1890, saying "when two elementary brain-processes have been active together or in immediate succession, one of them, on recurring, tends to propagate its excitement to the other" (8).

E. SUMMARY

CBA inbred mice were given avoidance sessions during which different conditioned stimuli were used. The mice performed very poorly if the CS consisted of a light, while the performance was much higher if a buzzer was used. A combination of light and buzzer stimuli (L + B) enhanced the performance in comparison to that observed during the sessions in which the buzzer or the light were used alone.

In other experiments mice were given sessions divided in two parts: the CS was the light during the first half of the session and the buzzer during the second part (L/B). In these groups the performance during the half of the sessions in which the buzzer was used was enhanced in comparison to that observed in a group in which the buzzer was not preceded by a training with the light.

These results indicate that a stimulus which had no power on its own right (i.e., light) exerted a dramatic influence on another stimulus (buzzer) when conjoined with it either simultaneously (L + B) or sequentially (L/B).

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NEWS NOTES

Under this heading appear selected items that are considered to be of special interest to psychologists.

The American Psychiatric Association invites applications for its annual Hofheimer Prize Award (\$1500) for outstanding research accomplishment in psychiatry and mental hygiene. Applicants must be U.S. citizens and not older than 50. If a group of co-workers are involved, then the majority must meet the citizenship requirement and their median age must not exceed 50. Any professional person who has done creative research relevant to the general field of psychiatry and mental hygiene is eligible. The work must have been published within the past three years. To apply, submit six copies of published work and data concerning age, citizenship, etc., by March 1, 1967, to Stanley F. Yolles, M.D., Chairman, Hofheimer Prize Board, 5206 Locust Avenue, Bethesda, Maryland 20014.

* * *

The 44th Annual Meeting of the American Orthopsychiatric Association will be held from March 20 through March 23, 1967, at the Washington Hilton Hotel in Washington, D.C. Close to 9000 psychiatrists, psychologists, social workers, educators, anthropologists, nurses, lawyers, and other professionals will attend the four-day program. They will take part in 65 sessions, 30 panels, and 52 workshops devoted to basic clinical and social problems of vital concern to the mental health field.

Program topics include American youth in a social struggle: the Appalachian volunteers; identifying the gifted child in a culturally deprived population; training and use of "poor" adults in mental health and education programs; the family in a society in transition; clinical dropouts; alcohol and narcotic addiction; mental retardation and brain damage; civil rights issues; childhood schizophrenia; impact of poverty programs; the military educational institution; and mental health of college students. The 1967 theme, The Impact of Schools in Human Development—A Critical Appraisal of a Social Institution, will be studied in 38 sessions, workshops, and panels.

Nonmembers are welcome as full participants. A complete preliminary program for the 1967 meeting will be available on request after December 10. Registration forms and further information may be secured by writing Marion Langer, Ph.D., Executive Secretary, American Orthopsychiatric Association, 1790 Broadway, New York, N.Y. 10019.

* * *

On October 3, 1966, at the 29th Annual Convention of the American Documentation Institute, a group concerned with "Information Handling in the Behavioral Sciences" was established as one of the Special Interest Groups within the organizational structure of the ADI. The formation of the group was a result of an invitational meeting which drew leaders from government agencies, educational and research institutions, and industry to an informal discussion of the problems of information transfer in the behavioral sciences.

Anyone who qualifies for membership in the ADI and who is professionally concerned with such aspects of information handling as publication, annotation, translation, coding, storage, retrieval, dissemination, flow, and use of documents and data in the behavioral sciences may join. Inquiries should be directed to Frieda B. Libaw, Chairman Pro Tem, Special Interest Group in the Behavioral Sciences, The Galton Institute, 8717 West Third Street, Los Angeles, California 90048.

* * *

The National Science Foundation announced on November 10, 1965, the awarding of nearly \$1.25 million in grants designed to provide summer research opportunities for 469 teachers from colleges where research facilities are comparatively limited. NSF will give \$1,244,980 in 72 separate grants to colleges, universities, and nonprofit laboratories throughout the United States to enable college teachers from every state in the Union to participate in research projects conducted by those institutions. In addition, many of the grants provide opportunities for some summer participants to obtain limited funds for the continuation of their summer research projects at their home institutions during the following two academic years.

Participants are to be chosen by the project directors at the institutions receiving the grants and *not* by the National Science Foundation. Inquiries and applications should be addressed to the project directors. To insure full consideration, early inquiry is advised.

A brochure listing the institutions offering summer programs of Research Participation for College Teachers may be obtained by sending a post card request to College Teacher Programs, National Science Foundation, Washington, D.C. 20550. The brochure is a guide giving a short description of each project, the type of participant for which it is intended, and the name and address of the director. The director will furnish details about requirements, application forms, and the deadline for applying.

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ATTITUDES TOWARD CIVIL LIBERTIES: A CROSS-CULTURAL STUDY*¹

Department of Psychology, North Dakota State University

JAMES O. WHITTAKER

A. INTRODUCTION

Recent studies of attitudes toward civil liberties among Japanese and American youth have presented some rather surprising results. Remmers and Radler (3) report that nearly half of an American teenage sample approved censorship of books and newspapers, one-third believed in restricting the right of free speech, and 26 per cent believed that police should be allowed to search a person or his home without a search warrant.

In Japan, Kato (1) utilized statements adapted from those employed by Remmers and Radler, and found significantly greater concern with individual rights and freedoms. As McGinnies (2) notes, "these findings might strike one as paradoxical . . . in view of Japan's relatively recent adoption of a constitution modeled after that of the United States" (2, p. 178). He raises the question of whether democratic ideals tarnish with time, or whether some indigenous qualities of Japanese youth predispose them to a closer affinity with certain democratic principles than is true of their American counterparts.

McGinnies administered a set of 12 items bearing directly upon civil liberties to over 600 Japanese and American students at three Japanese and three American universities. In many respects his results parallel those of earlier investigators. He found, for example, that American students favored censorship to a much greater degree than did the Japanese students. He also found that American students favored the teaching of sectarian religion in public schools, while the Japanese did not. In addition, there were significant differences in attitudes toward wire-tapping, censorship of movies, plays, books, and loyalty oaths. In each instance the Japanese sample adhered more closely than the American sample to the democratic ideal.

Several questions arise in connection with McGinnies' study. First, can

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¹ Those parts of this study conducted in India and Rhodesia were supervised by Robert D. Meade, Associate Professor of Psychology at Western Washington State College, Bellingham, Washington.

we assume that his findings are truly representative of the attitudes of American college students? His sample included only three Eastern universities. Second, are his findings valid today? At least two of the issues with which he dealt have been subject to considerable debate in Congress and elsewhere in the past few years. And finally, how do the attitudes of American students toward civil liberties compare with those of students in parts of the world other than Japan?

In the present study the author repeated McGinnies' procedure with a different sample of American students, and compared these results with data obtained from college or university students in Rhodesia, India, Brazil, Lebanon, and Hong Kong.

B. METHOD

Twelve statements taken from American Civil Liberties Union (ACLU) literature were utilized in assessing cross-cultural attitudes toward civil liberties. These were the same statements employed by McGinnies in his study. A five-point rating scale accompanied each statement, with the alternatives labeled "strongly agree," "agree," "undecided," "disagree," and "strongly disagree." Seven of the items were worded so as to be consistent with the ACLU's position concerning civil liberties, and five of the items were worded so as to be inconsistent with the ACLU's position. In each case the questionnaire was translated into the language of the area where it was administered.

All responses to the questionnaire were obtained in 1965 from undergraduate students attending colleges or universities in the above mentioned areas. The sample in each area included both males and females, and the total number of subjects involved was 555. This included 150 Americans, 61 Chinese, 55 Arabs, 134 Brazilians, 80 Indians, and 75 Rhodesians. The latter group consisted of African subjects attending teacher's colleges in that country. The American subjects involved were predominantly white, Protestant, middle-class males and females attending North Dakota State University.

In each cultural area outside of the United States, the questionnaires were presented by professors in the universities involved. Thus the project was not presented as an American undertaking. In addition, no reference was made to the fact that cross-cultural comparisons were to be made.

For the most part, the subjects were enrolled in lower division psychology or education courses and, since they were drawn from all parts of the universities, they may be considered representative of students in the particular universities where the data was collected. It should also be pointed out that all subjects were of approximately the same age—either in their late teens or early twenties.

C. RESULTS

Even though the 12 statements employed in the study are not presumed to constitute a scale of attitudes toward civil liberties, the investigators did calculate an overall score for each subject and mean scores for subjects in each cultural area. These scores were calculated by assigning numbers 1 through 5 to the alternatives that accompanied each statement. Alternatives favoring civil liberties were assigned the higher scores, while those opposed were assigned the lower scores. Thus, the overall scores ranged from 60 (maximum "pro" score) to 12 (maximum "anti" score). A score of 36 represented an overall "undecided" position.

The mean scores for subjects in each cultural area are shown in Table 1. All of these scores are on the "pro" side of the scale: i.e., above 36. In the analysis of this part of the data, scores for each area were compared with those from every other cultural area by means of *t*-tests. The differences were all significant at less than the .01 level of confidence, except for the USA-Lebanon difference which was significant at the .05 level, and the Lebanon-Rhodesian difference which was not significant. The Brazilian mean could not be compared with the others because the scores for individual subjects were not retained and, hence, the standard deviation could not be computed.

TABLE 1
MEAN SCORES OF SAMPLES FROM EACH COUNTRY

Country	Mean score
U.S.A.	44.69
Lebanon	42.84
Rhodesia	42.68
Brazil	41.40
Hong Kong	40.10
India	37.84

In addition to the overall analysis of the data, comparisons were made between areas on each individual issue in the questionnaire through the use of chi-square tests. To simplify these tests the investigators combined the five original response categories for each item into three categories. In this analysis they also compared McGinnies' data on each issue with the present American sample.

More than 50 per cent of the subjects in each cultural area agreed with the first statement presented: No. 1—*Government employees accused of disloyalty should have the right to know the sources of information against them and to cross-examine their accusers.* There were however, significant differences between the Indian responses and those of Americans, Brazilians, Lebanese, and Rhodesians. The Indian subjects took less of an affirmative

stand than did the others listed. In addition, there was a significant difference between Rhodesian and Lebanese subjects, determined primarily by the larger number of Rhodesian responses in the "undecided" category. The two American samples did not differ.

On the second issue, the present American sample strongly disagreed with statement No. 2—*Police and other censors should be allowed to ban books and movies that they consider to be "indecent or obscene."* McGinnies' sample, on the other hand, revealed strong agreement with this statement and the difference between these two American samples was highly significant. The present American subjects also differed significantly from all other subjects involved, except the Rhodesians. In general, Indian and Chinese subjects showed the greatest agreement with the statement.

In response to statement No. 3—*Personal ability alone should determine employment, regardless of the applicant's race, religion, or national origin*—there was almost universal agreement. Some differences were noted in degree of support, but these were for the most part minor.

Significant differences were observed between the two American samples in response to statement No. 4—*The teaching of sectarian religion should be permitted in public schools.* McGinnies' (1963) sample had strongly agreed with the statement, while the present (1965) sample had disagreed strongly. Here it seems possible that the Supreme Court decision of 1964 concerning prayer may account for the differences. Subjects in other cultural areas were divided on this issue, with many of them in the "undecided" category.

The two American samples were in general agreement with statement No. 5—*Representatives of the extreme left as well as the extreme right should have the same privilege of making public speeches as do other political leaders.* Subjects in other areas also were in general agreement with this statement, as they were with the next statement: No. 6—*Any private individual should have the right to criticize any government or government official anywhere in the world.*

In responses to the statement No. 7—*Police officials should have the right to listen in on private phone conversations*—there was a highly significant difference between McGinnies' American data and the present data. In his sample there was general support for wire-tapping, while in the 1965 sample there was general opposition. A few years ago it will be remembered that there was considerable debate in the United States about the use of wire-tapping for obtaining evidence in criminal cases. It may be that McGinnies' subjects were influenced by the arguments of the FBI and other police organizations supporting such methods. At present, however, these arguments

appear to be largely forgotten. In other cultural areas, there was strong opposition to such invasions of privacy by the police. The notable exception in this case was India, where almost half of the subjects agreed with the statement.

General support was found for statement No. 8—*Employers should be permitted to state their views regarding labor unions to their workers*. Only in India and Rhodesia did the investigators see any substantial deviation, and this was in degree of support rather than in direction.

In response to the statement No. 9—*Movies, plays, and books should be suppressed if they present an offensive characterization of a particular racial or religious group*—McGinnies' sample showed predominant agreement, while the present sample showed predominant disagreement. In connection with the issue of censorship relative to race or religion, the investigators again noted a significant difference between the two U.S. samples. Censorship is a "fact of life" to a greater or lesser degree in all of the countries outside the U.S. where the present work was carried out, and it may be that in these countries people have come to accept it. Investigators noted, however, that there were differences in relation to Issues No. 2 and No. 9—both dealing with censorship. Chinese subjects strongly support censorship when obscenity is involved, but they do not so strongly favor censorship when race or religion is at issue. Rhodesian Negroes, on the other hand, support censorship when the issue of race is involved but not when obscenity alone is at issue.

The most striking differences in connection with censorship, both for obscenity and race and religion, are between the present U.S. sample and other cultural areas. In general this U.S. sample opposed censorship of any kind, while there is general (although weak) support for censorship in most other areas.

The impression one gets from the responses to statement No. 10—*A person who claims the privilege against self-incrimination when asked if he is a communist is not necessarily a communist sympathizer*—is that subjects in other countries probably did not understand the issue. One-third or more subjects in Lebanon, India, and Rhodesia were "undecided." It should be noted, however, that without exception a greater percentage of subjects in every country "agreed" rather than "disagreed" with the statement.

In response to statement No. 11—*Tests of government employees' loyalty should be confined to sensitive positions involving military, atomic, or international affairs*—the investigators again find the two U.S. samples taking much the same stand. Both groups apparently believed that tests of government employees' loyalty should be extended beyond certain limited types of jobs. This contrasts with the results obtained elsewhere, in which the investiga-

tors see greater general agreement with the statement, but also, at the same time, greater indecision. It should be noted that this particular issue tends to be rather uniquely American in character. Other cultural areas studied have not experienced the controversy concerning loyalty oaths that we have seen in the U.S.

Finally, in contrast with the loyalty issue involved in No. 11, when the investigators asked for responses to statement No. 12—*Public school and college teachers should be required to sign a non-communist loyalty oath*—they found general agreement among the U.S. and other countries studied. More than half of all subjects tested (except in India) disagreed with the statement. Among Indian subjects there was substantially greater indecision than in any of the other cultural areas.

D. DISCUSSION

The present American sample differed significantly from the American sample used by McGinnies in responses to Issues Numbers 2, 4, 7, 9, and 11. On the first four of these issues, the results were reversed. That is, one group was opposed while the other group was favorable. On Issue Number 11 the results differed, but they were in the same direction.

In connection with Issues Number 4 (religion in the schools) and Number 7 (wire-tapping), the investigators feel that events that intervened between McGinnies' testing in 1963 and the present (1965) testing may account for the differences. Their feeling is that retesting in the universities used by McGinnies would reflect a change in attitudes on these issues.

No entirely satisfactory explanations appear to account for the differences on other issues—mainly because the investigators are not provided with details concerning the characteristics of McGinnies' subjects. The Eastern sample of students, it will be recalled, strongly favored censorship in Issue Number 2 (obscenity) and in Issue Number 9 (religious and racial), while the Midwestern sample strongly opposed censorship in both cases. It is possible that McGinnies' sample included a greater number of minority group members than did the present Midwestern sample. Hence the issue of censorship relative to racial or religious factors may have been more salient in McGinnies' subjects. In this connection the reader is reminded of the difference among Rhodesian African subjects in response to the two censorship issues. In addition, if there were a large number of Catholics in McGinnies' sample, this conceivably could account for the support of censorship relative to obscenity, since this is the position taken by their Church.

It is clear that one cannot generalize from a small sample of American

students to students as a whole in this country. Indeed it may be argued that one Midwestern sample, as used in the present study, is *less* representative than are the three Eastern samples used by McGinnies in his study. Nonetheless, to obtain an adequate picture of the attitudes of American college students toward civil liberties, various ethnic, religious, and regional groups would have to be included, since obviously there are characteristics in these various groups that have a significant bearing on such attitudes. The same thing of course, may be said relative to the present samples in various other cultural areas. The investigators strongly suspect for example, that attitudes of Rhodesian African college students toward civil liberties are not representative of white college students in that country. The responses in the present study, however, as well as the responses observed by McGinnies, are of interest and lend themselves to some generalizations, as long as one keeps in mind the limitations imposed by the samples involved.

The investigators suspect that the nature of McGinnies' sample, and the time at which the study was conducted, resulted in an unnecessarily bleak picture of American students *vis-à-vis* civil liberties. It may very well be, of course, that even with a more representative sample the Japanese groups would still be found to adhere more closely than the American groups to the democratic ideal. However, when they compared the percentages of subjects in the present sample supporting civil liberties with McGinnies' Japanese sample, they did not observe many of the differences reported previously.

In terms of the cross-cultural comparisons reported in the present study, it is perhaps not surprising to find all groups on the favorable or "pro" side of the scale. Although the differences in overall scores were statistically reliable in almost all cases, the absolute differences were not great. It was surprising, however, to see India, a country which prides itself on democratic principles, at the very bottom of the list and in fact very close to the "undecided" position in overall terms.

On individual issues there were differences (and similarities) between cultures which the investigators found of considerable interest. It is apparent, for example, that where censorship exists (and has existed for a long time) people come to accept it, although not with wholehearted support. It is also apparent that religious and racial differences affect attitudes toward censorship. Minority group members tend to oppose books, articles, or movies that portray their group in an unfavorable light.

Attitudes toward free speech appear to be affected by particular national events. In those countries which have had recent unpleasant experiences with Communism, there is less support for freedom of speech for Communists. Free

speech in other respects however, had more wide-spread support. There was general agreement that one should have the right to criticize his own and other governments, and there was also general agreement that employers should be allowed to present their views of labor unions to their workers.

The issue of teaching specific religions in the schools appears to be of greater concern to Americans than to subjects in other cultural areas where work was carried out. In this connection the investigators observed a much larger percentage of undecided positions than for many other issues. It was also of interest to note that in Brazil—a predominantly Catholic country—only slightly over half of the subjects approved of teaching religion in the schools.

The investigators also saw general agreement in all cultural areas where they worked concerning one's right to know the sources of information against them and to cross-examine his accusers—at least in cases where the issue of national loyalties is involved. In addition there was general agreement that personal ability alone should determine employment, and that police should *not* have the right to listen in on private telephone conversations. And finally, there was general agreement (except for India) that school and college teachers should not be required to sign loyalty oaths.

In conclusion, it should again be pointed out that the statements employed in the present study were not presumed to constitute a scale of attitudes toward civil liberties. A more extensive scale might affect the relative positions of particular countries as compared with their positions in this study. Furthermore, even different samples in these various countries might yield substantially different results. In this paper the investigators have pointed out several factors, such as racial and religious differences, that undoubtedly affect responses to specific items. Consequently, as McGinnies warned in his report, extrapolation beyond the groups utilized in this study should be made with caution.

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BRAIN BLOOD-SHIFT THEORY: A NOTE ON THE ABORTION OF VISUAL CLOSURE*

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An article (1) in an earlier issue of this journal displays a square figure composed of 16 smaller black squares separated by narrow white strips. When the intersection of white strips in the very center of the figure is fixated visually at ordinary reading distance, gray closure patches appear at the other white-strip intersections. (According to Wolfgang Köhler's (2) isomorphic Gestalt theories, the closure patches result from overlap in spreading electrical excitation in the visual brain cortex.) However, any directly fixated intersection continues to appear white; closure fails to occur at that point.

The report cited above explained the absence of closure at the fixated intersection in terms of brain blood-shift theory principles: (a) brain tissue immediately surrounding the point of maximal excitation will be deprived of blood, with a gradient of undernourishment that falls off for more distant cortical points; and (b) the extent of the gradient will widen as the intensity of local excitation is increased. Neurons closest to the small part of the occipital cortex that corresponds to the point of visual fixation were said to "... suffer the greatest deprivation of metabolites . . . locally block the spread of excitation, and thus abort the viewer's experience of closure" (1, p. 237). It was predicted that if the distance between the viewer and the figure were increased, this would "... put the whole image within the gradient and the patches will fade. Under brighter light they will disappear at a lesser distance" (1, p. 237).

These predictions have been verified for a sample of 15 people (sixth-grade students and their teacher at William Hatch School in Oak Park, Illinois). All subjects were 11 years old, except for two males aged 10 and 40; four subjects were female.

The closure-illusion figure (see Figure 1) was mounted on a small (6- by 18-inch) wheeled, wooden platform along with a lamp (Tensor student model 7190, 2 ampere, number 93 bulb). With ordinary room illumination held constant, subjects were instructed to fixate the intersection of white

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strips in the center of the figure. The existence of a disappearance threshold (in inches between subject and figure) for the gray closure patches was investigated by rolling the platform under two conditions: lamp off and lamp on. As predicted, all subjects reported such thresholds under both conditions. For reliability, four threshold reports for each condition were obtained from each subject and averaged, the usual precautions being taken for randomizing ascending and descending trials as well as conditions.

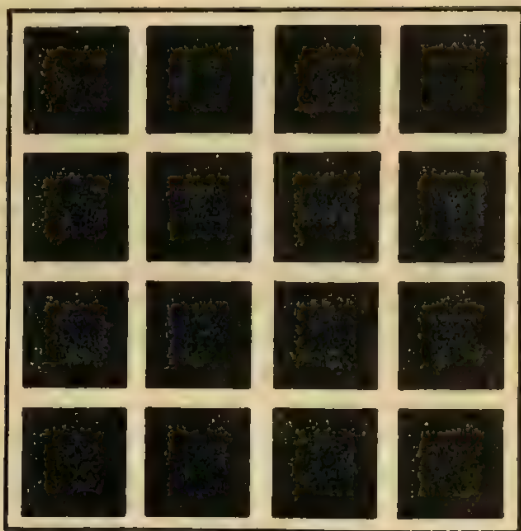


FIGURE 1
CLOSURE ILLUSION

Closure illusion appears at all white intersections but the one fixated (see text for brain blood-shift interpretation).

For every subject tested, the cortical blood-shift gradient clearly seemed to widen when stimulus intensity was increased. Arithmetic mean thresholds for the group varied sharply and consistently as follows: lamp off, 103.9 inches; lamp on, 60.2 inches. Individual means ranged from 43 to 174 inches when the lamp was off, and from 32 to 116 inches when it was on. In every case the mean threshold value was smaller when the lamp was on, ranging in individual cases from 9 to 78 inches closer to the closure figure than the lamp-off threshold. By the nonparametric Sign Test (one-tailed) there is only one chance in 30,208 that such a set of data could have arisen at random.

Beyond its theoretical implications, the procedure just described seems promising as a clinical tool. Preliminary impressions suggest that individual

differences in blood-shift response as measured by this simple closure-illusion test profitably may be used in predicting many human characteristics (e.g., age, sex, intelligence, introversion-extraversion, anxiety, atherosclerotic deterioration, EEG patterns, reaction time).

It has been predicted by D. Chyatte that a closure patch should appear at the fixation point as distance between observer and figure increases to reduce the size of the retinal image still further; enough of the isomorphic brain pattern then should fall at the very center of the blood-shift gradient (where elevated blood level should facilitate spreading excitation). This effect has been reported by pilot-study subjects; verification in some cases is limited by the visual acuity of the subject.

Variations in the hue of such closure figures suggest remarkable possibilities concerning brain structure. For example, we have constructed figures in which the small squares are red (giving red-tinged closure patches at the white intersections) and others in which they are blue (producing blue-tinged patches). When the squares are white and the strips are black, white patches appear. Does this mean that there is a unique synaptic network in the visual system that mediates the experience of each hue or color? Does blood shift operate over an intermeshed series of quasiautonomous neuronal nets; one for black, another for red, another for blue, and so on?

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SOME PERSONALITY CHARACTERISTICS OF THE CULTURALLY DISADVANTAGED*

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A. INTRODUCTION

Psychologists, educators, and others are turning their attention to the problems of the culturally disadvantaged. People so designated are usually characterized by statements to the effect that they do not expect adults to understand them, are not regarded very highly by their culturally advantaged peers, have distinct feelings of inferiority, and have ambitions that either may be minimum because of poor self-acceptance or exaggerated as a result of poor self-insight (8, 9). Although researchers (2, 4, 5, 7) have cited personality characteristics as being among those variables known to be related to success of individuals in general, there is a dearth of empirical evidence relative to the degree to which those traits exist among the culturally disadvantaged.

The purpose of this investigation was to identify characteristics of personality among a representative sample of culturally disadvantaged college freshmen. The specific questions to be investigated were as follows: (a) On which of the variables will the males score highest and on which will they score lowest? (b) On which of the variables will the females score highest and on which will they score lowest? (c) Which of the personality characteristics that are known to correlate significantly with academic achievement, as measured by grade point average, are possessed by subjects in this investigation?

B. METHOD

1. *Subjects*

The 306 Ss in the study, 187 females and 119 males, came from a pool of 415 freshmen, the total fall, 1964, freshman enrollment of a southern undergraduate college for culturally disadvantaged (CD) students in Alabama.

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2. Instrument

One possible reason for the lack of success of many of the personality test studies, particularly those based upon adjustment inventories, is that the social desirability values of the items are not controlled. The Edwards Personal Preference Schedule (EPPS) was developed with the intention of minimizing a *S*'s natural tendency to endorse items of a socially desirable nature. The test format consists of 225 pairs of items, each pair being matched on the basis of social desirability scale value, and each item in the pair representing one of 15 different needs. Thus, 15 scores were obtained during the administration of the test in November, 1964.

C. RESULTS

Separate data are shown for male and female *Ss*. Table 1 presents characteristic identification for the CD sample, as based on the EPPS variables. Included for meaningful interpretative purposes are the means and standard deviations of the EPPS variables for the normative sample of 749 females and 760 males, each of whom was a high school graduate with some college training.

Table 2 shows percentile norms for the personality variables that are known to have significant positive correlations with academic achievement.

The highest scores for the 119 freshman males were on deference, order, abasement, endurance, nurturance, aggression, succorance, achievement, and affiliation, in the order given; their lowest scores were on dominance, autonomy, heterosexuality, exhibition, and consistency.

The 187 freshman females scored highest on order, deference, abasement, achievement, endurance, aggression, nurturance, intraception, and succorance; their lowest scores were on exhibition, heterosexuality, autonomy, consistency, dominance, and affiliation.

Of the personality characteristics that are known to have significant positive correlations with academic achievement (2, 4, 5, 7) when measured by grade point average (see Table 2: achievement, autonomy, exhibition, dominance, and consistency), the culturally disadvantaged freshman males and females were high on achievement with the means for males and females at the fifty-second and sixty-sixth percentiles, respectively.

The males had significantly higher means ($p < .01$) than did the females on achievement, autonomy, dominance, heterosexuality, and aggression, while the women had significantly higher means than the males on deference, intraception, succorance, abasement, nurturance, and change. The seeming inconsistency with regard to the achievement variable is a function of the separate computation of statistical data for males and females.

TABLE 1
MEANS AND STANDARD DEVIATIONS OF THE EPFS VARIABLES FOR THE CULTURALLY
DISADVANTAGED AND NORMATIVE SAMPLES

Variable	Culturally disadvantaged sample				Normative sample			
	Male	Female	Standard deviations	Means	Male	Female	Standard deviations	Female
Achievement	15.24*	14.33	1.66	3.67	15.66*	13.08	4.13	4.19
Deference	14.03	15.01*	3.66	2.86	11.21	12.40*	3.59	3.72
Order	13.58	14.02	3.37	2.71	10.23	10.24	4.31	4.37
Exhibition	12.14*	10.70	3.38	4.51	14.40	14.28	3.53	3.65
Autonomy	10.76*	9.06	3.67	3.08	14.34*	12.29	4.45	4.34
Affiliation	14.75	15.34	4.24	3.60	15.00	17.40*	4.32	4.07
Intrapception	15.71	17.22*	3.44	3.11	16.12	17.32*	5.23	4.70
Succorance	10.98	11.90*	3.70	3.76	10.74	12.53*	4.70	4.42
Dominance	12.92*	11.29	3.83	3.43	17.44*	14.18	4.88	4.60
Abasement	16.03	17.50*	3.90	6.14	12.24	15.11*	4.93	4.94
Nurturance	15.19	16.68*	3.52	3.70	14.04	16.42*	4.80	4.41
Change	14.39	16.37*	3.46	3.62	15.51	17.20*	4.74	4.87
Endurance	16.25	17.73*	4.48	3.73	12.66	12.63	5.30	5.19
Heterosexuality	13.84*	9.25	5.43	5.05	17.65*	14.34	5.48	5.39
Aggression	13.26*	11.57	3.81	3.73	12.79*	10.59	4.59	4.61
Consistency	10.15	10.37	2.15	1.73	11.53	11.74	1.88	1.79
N	119	187			760	749		

* This mean is significantly larger ($p < .01$) than the corresponding mean for the opposite sex.

D. DISCUSSION

The most important finding of the study was that the culturally disadvantaged sample scored relatively high on the need achievement. This finding is noteworthy in view of the positive correlation between achievement and grade point average for students in general. The CD females scored significantly higher on the need achievement than did the normative female sample, while there was no difference on that need between the two male groups. This phenomenon is supported by prior research (6). One possible explanation lies in the difference in adult roles relative to the need achievement of the CD females as opposed to females in general.

It is reasonable to suppose that the high need scores on order resulted from poorly qualified teachers over the years who had limited materials and who followed highly formal and mechanical methods. Repression of independence through arbitrary subjection and conformity as well as family insecurity and lack of masculine family models probably contributed to low scores on dominance, autonomy, and exhibition and to high scores on the self-deflating needs of deference and abasement (9, p. 7).

The low consistency scores may be attributable to a reading problem, an attempt at faking, a lack of differential attitudes, annoyance with the demands made by the forced-choice situations on the instrument, or any combination of these.

It could be argued that individuals may be culturally disadvantaged because of their peculiar personality characteristics, thereby accounting for the differences found between the CD group and the standardization group. While this might be a possibility, it does not suffice as an explanation of the direction of the within-group differences on some of the variables between the CD males and females as compared with the direction of those differences for their counterparts in the standardization group. It is obvious that there are many unanswered questions. However, where data are not available to provide adequate answers, it is not deemed apropos to attempt to draw any sweeping conclusions or to enter into lengthy theoretical speculation.

E. SUMMARY

The Edwards Personal Preference Schedule was administered to 187 female college freshmen and 119 males to identify personality characteristics of the culturally disadvantaged. An analysis of the data provided evidence that significant differences in personality characteristics exist between the culturally disadvantaged males and females, culturally disadvantaged males and standard-

ization group males, and culturally disadvantaged females and standardization group females. Specific personality variables were listed, and some possible reasons for the differences were suggested.

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PERSONALITY PROFILES OF HIGH, MIDDLE, AND LOW MAS SUBJECTS*

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A. INTRODUCTION

During recent years, the Taylor Manifest Anxiety Scale (MAS) has been employed as a technique for defining drive level. Studies of the relationship between MAS level and performance on a variety of tasks have demonstrated that high MAS subjects are superior on simple or noncompetitive tasks, and low MAS subjects are superior on difficult or competitive tasks (2, 6, 10, 11, 12, 13).

A basic difficulty with much of this research has been whether the MAS measures drive which is presumed to be responsible for performance discrepancies found between these two groups, or whether nonmotivational variables which affect performance in a similar fashion are involved.

Taylor has herself called attention to this problem: "Undoubtedly, there are many characteristics other than drive on which anxious and non-anxious Ss differ; the investigation of these additional properties of anxiety groups and their influence on performance is certainly both legitimate and important . . ." (13, p. 303).

The present study was an attempt to compile descriptions from several personality inventories of individuals with differing MAS or drive levels. The personality profiles are intended to suggest factors other than drive level for understanding the differences in performance of these individuals.

B. METHOD

A group of 420 male undergraduate students were screened with the MAS at Boston University; 96 were selected for the study. These subjects were divided equally into a low MAS group (MAS scores 1-7), a middle MAS group (MAS scores 12-17), and a high MAS group (MAS scores 21-36). These subjects were then tested with the Cattell 16 Personality Factor Ques-

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tionnaire (16 PF), the Edwards Personal Preference Schedule (PPS), and the self-concept discrepancy scale.

The self-concept discrepancy scale consists of three measures (9): discrepancy between "Self" and "Ideal Self" (I-S), discrepancy between "Social Self" and "Ideal Self" (I-O), and discrepancy between "Self" and "Social Self" (S-O).

The Cattell 16 PF is a factor analytically based personality inventory in which each item is saturated by one of the 16 "source traits" of ability, temperament, and character integration (3).

The Edwards PPS is an inventory designed to measure 15 variables of H. A. Murray's manifest need system (5). The items are in a forced-choice form, with the alternatives closely matched on social desirability.

C. RESULTS

Table 1 shows the results of the comparisons between the three anxiety groups (high, middle, and low) in terms of the various personality measures.¹ As can be seen from this table, the only significant comparison ($p < .01$) for the self-concept measures was between high and low MAS groups on the I-S variable. There were two factors on the Cattell 16 PF on which high, middle, and low MAS groups differed significantly. These factors, C and Q₄, had correlations with the MAS of $-.46$ and $+.38$, respectively. The three Edwards PPS variables for which there were significant differences or trends toward significance between MAS groups are SUC, ABA, INT.

Correlation values between the three self-concept discrepancy values, I-S, I-O, and S-O, for the three MAS groups revealed a significant positive relationship between I-O and S-O for all three MAS groups. A significant positive relationship was found between I-S and I-O for the middle and high MAS groups, but not for the low MAS group. Finally, a positive correlation between I-O and S-O was significant only for the high MAS group.

D. DISCUSSION

1. *The Relationship Between MAS Level and Self-Concept Measures*

The self-concept discrepancy measures revealed a significant difference

¹ The means and standard deviations of the three MAS groups on the self-concept discrepancies, Cattell 16 PF Factors, and the Edwards PPS, as well as the correlation values on the self-concept discrepancies, have been deposited as Document number 9235 with the ADI Auxiliary Publications Project, Photoduplication Service, Library of Congress, Washington, D.C. 20540. A copy may be secured by citing the Document number and by remitting \$1.25 for photoprints, or \$1.25 for 35-mm microfilm. Advance payment is required. Make checks or money orders payable to Chief, Photoduplication Service, Library of Congress.

TABLE 1
t-VALUES FOR SELF-CONCEPT DISCREPANCIES, AND *t*-VALUES AND *r*-VALUES
 FOR THE CATTELL 16 PF FACTORS AND THE EDWARDS PPS VARIABLES

Personality variable	<i>t</i> -value			<i>r</i> -value (total MAS group)
	HA vs. MA	HA vs. LA	MA vs. LA	
Self-concept discrepancy				
I-S	1.60	3.21**	1.70	—
I-O	-0.18	0.56	0.68	—
S-O	0.56	0.27	0.82	—
Cattell factors				
Emotional vs. mature (C)	-2.50*	-5.63***	-2.76*	-.46***
Timid vs. adventurous (H)	-1.96	-2.49*	-0.74	-.39**
Trustful vs. suspecting (L)	0.71	3.10**	2.29*	+.35**
Simple vs. sophisticated (N)	-0.17	-2.09*	-1.98	-.22*
Confident vs. insecure (O)	5.33***	6.43***	1.89	+.60**
Lax vs. controlled (Q ₃)	-1.90	-3.69**	-1.72	-.33**
Stable vs. tense (Q ₄)	2.35*	4.73**	2.28*	+.38**
Edwards variables				
SUC	2.31*	3.89*	1.78	+.44**
ABA	1.48	2.60*	1.05	+.25*
INT	0.35	-1.81	-1.87	-.21*

* $p < .05$.

** $p < .01$.

*** $p < .001$.

($p < .01$) between high and low MAS groups and a trend toward significance between the high and middle and the middle and low MAS groups on factor I-S (see Table 1). The discrepancy between I-S was greatest for the high MAS group and smallest for the low MAS group. This suggests that the high MAS subject evaluated himself more unfavorably than did the low MAS subject. There were significant correlations ($p < .01$) for the high MAS group between (a) I-S and I-O, and (b) I-S and S-O.

The significant relationship between I-S and I-O indicates that high MAS subjects had a low self-opinion and also felt that others held an unfavorable opinion of them. The significant relationship between I-S and S-O indicated that these subjects had low self-opinion and also the feeling that they were incorrectly perceived by others.

2. The Relationship Between MAS Level and Edwards PPS

The Edwards PPS provided additional information about the high and low MAS subjects. There were significant differences between the high and low MAS groups on factors SUC and ABA and a trend toward significance on factor INT. Correlation values for the entire group corroborated these *t*-test results.

The personality traits measured by these factors showed the low MAS subjects to be independent, to analyze their own motives and those of others, and to be capable of predicting the actions of others. The high MAS subjects, in comparison, were dependent upon the encouragement, sympathy, and affection of others, felt timid in the presence of superiors, and inferior to others in most respects.

3. *Profiles of High vs. Low MAS Subjects*

In view of the contrasting personality profiles of the high and low MAS subjects, the difference in performance with respect to MAS level can be better understood. The low MAS subject can be described as one who, in comparison to the high MAS subject, has more understanding of a situation, more self-confidence and a higher evaluation, is more emotionally stable, more sophisticated, and less confused and tense in a new situation.

This interpretation is consistent with the positive correlation between the MAS and neuroticism, and the negative correlation between the MAS and extraversion found by others (1, 7).

The greater dependency of the high MAS subject suggested that he would wish to please the experimenter and thereby be accepted by him. Drive level would therefore be higher in the experimental situation, and would result in the subject's trying his utmost to perform well. As the task became more difficult, though, the excessive emotional involvement in the situation would interfere with the high MAS subject's performance. The low MAS subject would not exert as much effort as would the high MAS subject in performance on the noncompetitive task because of his lack of need to please the experimenter, whereas the low MAS subject would perform better than would the high MAS subject on the competitive task because of his lack of emotional involvement and his ability to adapt to new situations.

The findings also have implications for the individual's reactions to participating in psychological research—what Orne (8) has called "the social psychology of the psychological experiment." The low MAS subject's higher degree of self-confidence and skill in dealing with new situations suggest that he is more responsive than is the high MAS subject to the "demand characteristics of the experimental situation" (8, p. 779)—that is, the low MAS subjects should be more adept than the high MAS subjects at determining the experimental hypothesis on the basis of the cues provided by the experimenter. Greater awareness of the experimental hypothesis should, according to Orne, lead either to perfunctory performance consistent with the surmised pre-

dictions or deliberate efforts to prove the experimenters wrong. Given the low MAS subject's self-confidence and higher evaluation, the latter course of action is the more likely one.

E. SUMMARY

The Taylor MAS, the Cattell 16 PF, the Edwards PPS, and the self-concept discrepancy were administered to 96 male college students. A third of the subjects had MAS scores from 1-7, a third from 12-17, and a third from 21-36, providing a low, middle, and high MAS group.

Correlations between MAS scores and the personality measures and *t*-tests between MAS levels with respect to each measure revealed two contrasting personality profiles for the high and low MAS groups.

The low MAS subject was described as one who, in comparison to the high MAS subject, had more understanding of a situation, more self-confidence, a higher self-evaluation, was more emotionally stable, more sophisticated, and less confused and tense in a new situation.

It was suggested that performance with respect to MAS levels could be better understood by consideration of the differing personality profiles.

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ADAPTATION TO 23½-HOUR FOOD DEPRIVATION UNDER TWO CONDITIONS OF REINFORCEMENT*

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A. INTRODUCTION

Several studies have investigated the adjustment of rats to different cycles of food deprivation (1, 3, 6, 7). Although the evidence suggests that animals under 36-hour deprivation cycles adjust with considerable difficulty (1) and that Ss under 47- and 71-hour cycles do not adjust at all (3), Ss under 23-hour cycles appear to adjust within 15 to 18 days (3, 7). However, measures of adjustment in these studies were taken under free-feeding conditions and not under conditions where Ss had to work for food.

The present study was undertaken to investigate the adjustment of rats to 23 1/2-hour food deprivation cycles under two conditions of bar pressing for food and to increase the generality of the findings by including both sexes in the conditions. Since the time required for adjustment varies with the availability of water (4), no attempt was made concomitantly to manipulate drive states related to thirst.

B. METHOD

1. Subjects

Sixteen 90-day-old hooded rats of the Washington State University strain (10 males and six females), with an average body weight of 300 grams, were used as Ss. The animals were housed individually with water available at all times in the home cage and were maintained on a normal day-night cycle throughout the experiment.

2. Apparatus

A 10- × 12- × 15-inch Skinner box, equipped with a trap-door access in the top and a transparent plastic front, was used for training and adaptation sessions. Although releasing of the food pellet following displacement of the

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¹ Data for the present study were collected during the senior author's tenure on the faculty of Whitworth College, Spokane, Washington.

bar (30 gram press) was automatically controlled by a system of relays, the equipment for programming the reinforcement and recording the number of bar presses was regulated manually. A water bottle was attached to the outside of the apparatus and the nozzle introduced through a small hole adjacent to the bar. Water was available to *Ss* on an *ad libitum* basis during training and adaptation. The *S*'s general behavior could be observed indirectly through a mirror placed at an angle to the transparent front of the box. Fluorescent lighting in front of and above the apparatus assured uniform illumination during sessions.

3. Procedure

Initially, all *Ss* were given 1/2-hour training sessions in bar pressing for food under an average condition of 36-hour food deprivation. Between training trials, *Ss* were free fed for an average period of 30 hours in the home cage to minimize the cumulative effects of deprivation. Training was continued until each *S* had established an individual base-line rate of bar pressing. Following training, all *Ss* were put on an *ad libitum* free-feeding schedule for nine days to bring body weights up to the pretraining level.

The 16 *Ss*, then, were randomly assigned to two conditions of food reinforcement with the restriction that half of the males and half of the females be assigned to each condition. Under one condition (CR), *Ss* received one precision food pellet² (45 milligrams) following each bar press; whereas, under the other condition (FR), *Ss* received one pellet following two successive responses. Measures of adaptation (number of bar presses, food consumption, and percentage of weight gain during session) were taken on all *Ss* for 12 successive days under conditions of cyclic 23 1/2-hour food deprivation. All adaptation sessions were scheduled between the hours of 9:00 A.M. and 12:00 P.M. Since all 16 *Ss* could not be tested in a single morning, the beginning of the adaptation procedure varied from 10 to 30 days after termination of the initial training period. Because time after training was confounded by sex differences, no attempt was made to evaluate the importance of this variable.

The procedure for any one adaptation session was as follows. After being food deprived for 23 1/2 hours in the home cage, the *S* was removed from the cage, weighed, and put in the Skinner box. The number of bar presses (under either CR or FR conditions) was measured for a 1/2-hour period, after which time the *S* was weighed again and returned to the home cage. The difference

² Appreciation is expressed to Dr. John Thompson of Gonzaga University, Spokane, Washington for supplying the precision food pellets.

between the post- and the pretrial weight was taken as the during-session weight gain. Food consumption was determined by multiplying the number of pellets dispensed under the two reinforcement conditions by the weight of the precision pellet.

C. RESULTS

The Mean number of bar presses for Ss under the two reinforcement conditions on successive days of adaptation is presented in Figure 1. A trend analysis of the data (5) indicated a significant difference in the number of bar presses for the two reinforcement groups ($F = 7.49$; $df = 1/14$; $p < .05$), a significant difference in the number of bar presses between successive days of adaptation ($F = 13.01$; $df = 11/154$; $p < .01$), and a significant Reinforcement Group \times Successive Days interaction ($F = 3.58$; $df = 11/154$; $p < .01$).

The Mean amount of food consumption for Ss under the two reinforcement conditions on successive days of adaptation is presented in Figure 2. A trend

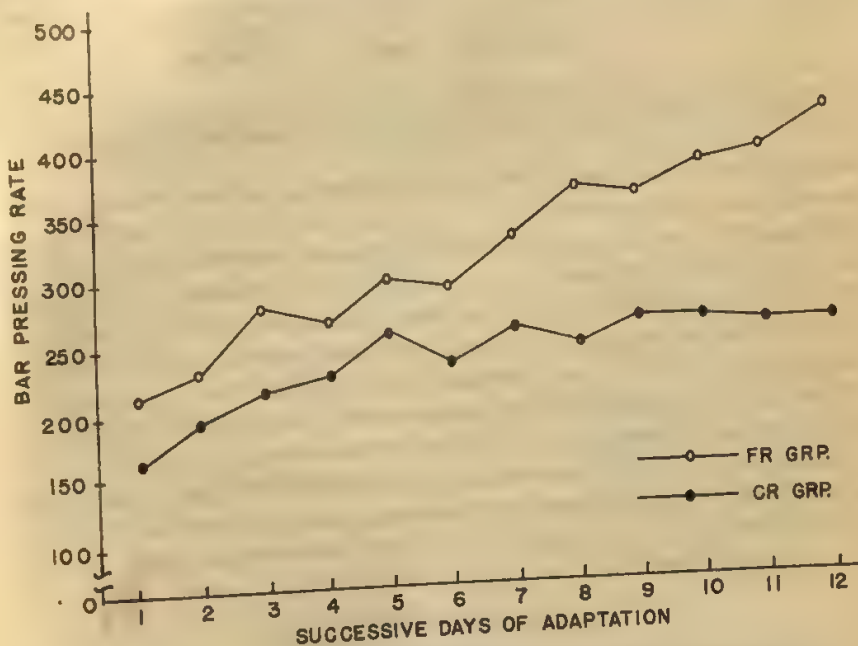


FIGURE 1
MEAN NUMBER OF BAR PASSES FOR CR GROUP (FIVE MALES, THREE FEMALES) AND
FR GROUP (FIVE MALES, THREE FEMALES) ON SUCCESSIVE DAYS OF ADAPTATION

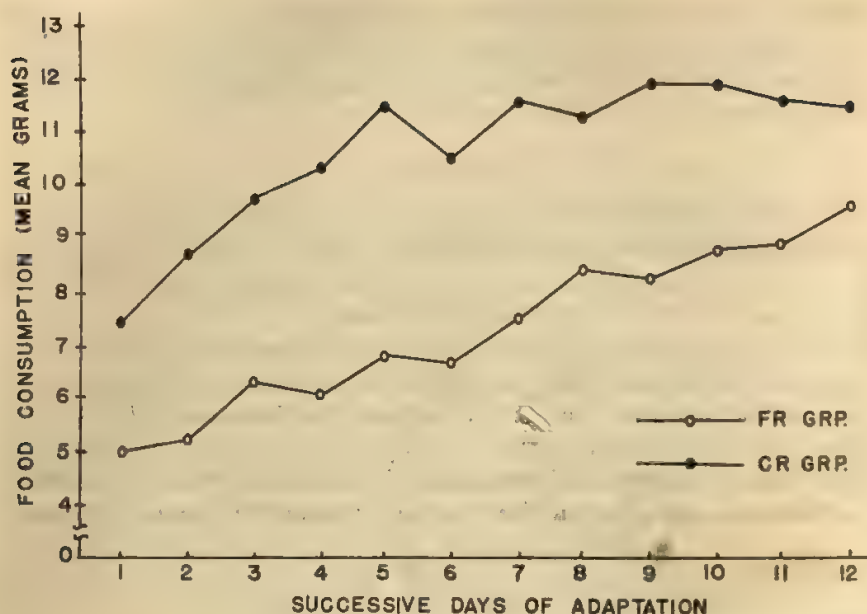


FIGURE 2
MEAN AMOUNT OF FOOD CONSUMPTION FOR CR GROUP (FIVE MALES, THREE FEMALES)
AND FR GROUP (FIVE MALES, THREE FEMALES) ON SUCCESSIVE DAYS OF ADAPTATION

analysis of the data yielded a significant difference in the food consumption of the two reinforcement groups ($F = 11.55$; $df = 1/14$; $p < .01$), and a significant difference in food consumption between successive days of adaptation ($F = 18.93$; $df = 11/154$; $p < .01$). No significant Reinforcement Groups \times Successive Days interaction effect was observed on food consumption.

The Mean percentage of during-session weight gain for Ss under the two reinforcement conditions on successive days of adaptation is presented in Figure 3. A trend analysis of the data indicated *no significant* difference in the percentage of weight gain for the two reinforcement groups ($F = 3.65$; $df = 1/14$; $p > .05$). However, a significant difference in the percentage of weight gain between successive days of adaptation was found ($F = 18.49$; $df = 11/154$; $p < .01$) as well as a significant Reinforcement Groups \times Successive Days interaction ($F = 2.20$; $df = 11/154$; $p < .05$).

D. DISCUSSION AND CONCLUSION

The significant difference in the number of bar presses by Ss in the CR and the FR groups indicates clearly that amount of reinforcement is an important

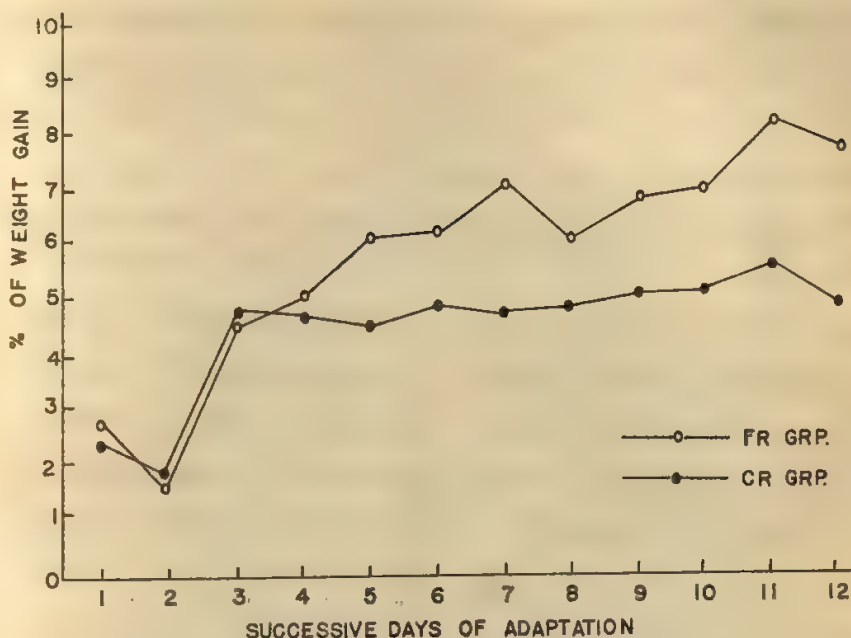


FIGURE 3
MEAN PERCENTAGE OF DURING-SESSION WEIGHT GAIN FOR CR GROUP (FIVE MALES, THREE FEMALES) AND FR GROUP (FIVE MALES, THREE FEMALES)
ON SUCCESSIVE DAYS OF ADAPTATION

factor in the adjustment of rats to 23 1/2-hour food deprivation, even when performance variability within the groups is augmented by sex differences. As might be expected, the rate of bar pressing by the FR group over successive days of adaptation was consistently higher than that of the CR group, since FR Ss were getting half as much food for an equal amount of work. This higher rate was not enough, however, to compensate for the less frequently obtained food, since consumption for the FR group was both consistently and significantly less than that for the CR group (see Figure 2).

The significant Reinforcement Groups \times Successive Days interaction effect on number of bar presses indicates that the rate of adaptation for the two reinforcement groups differed. The Ss under the CR condition were approaching some degree of stability at nine days; whereas Ss under the FR condition continued to show an increase in bar pressing rate at the end of the 12 days. Although a difference in the rate of adjustment under the two reinforcement conditions, also, is suggested in the case of food consumption

(see Figure 2), such a conclusion is not supported by a similar statistically significant interaction effect. The apparent stability in the bar pressing rate of the CR Ss at nine days is not necessarily in conflict with previous findings of 15 to 18 days adjustment under 23-hour cyclic food deprivation. The Ss in the present study were tested for adaptation after training on the task required in adaptation. Since free-feeding adaptation in other studies has not been preceded by training in the task, the more rapid adjustment of the present CR Ss may reflect the advantage of previous training to the adaptation process.

Under the conditions of the present study, the percentage of weight gain was not a sensitive index of differences in adaptation. Although on 10 of the 12 successive days, the percentage of weight gain for the FR group was greater than that for the CR group (see Figure 3), such a difference did not reach statistical significance. This greater percentage of weight gain by the FR Ss (although not significant) is, nevertheless, consistent with the findings related to bar pressing and food consumption. Since the FR group was getting less reinforcement per session than the CR group, even with their significantly greater rate of bar pressing, the average *presession* weight of the FR Ss on successive days dropped more than did that of the CR Ss. However, with a greater increase in rate of bar pressing during successive periods, the FR Ss were able to consume enough food to bring their *post-session* weight up very close to that of the CR Ss by the end of the 12 days. Since percentage of weight gain has been successfully used in free-feeding adaptation with male Ss (3), the degree to which the measure is sensitive may depend upon the presence or absence of adaptation-task training and mixed sexes within experimental conditions.

The present findings suggest the need for further investigating the relationship of training and adaptation. Since the present Ss had been trained on the adaptation task, the measures appear to be more meaningful indices of adjustment to the *deprivation*. In previous free-feeding studies, the Ss were not only adjusting to the deprivation condition, but, probably, were also learning the time and response requirements of the cyclic conditions accompanying the physical deprivation.

Employing similar CR and FR reinforcement when the amount of food deprivation is concomitantly varied would seem to be a meaningful extension of the present study. Since the effect of different amounts of food deprivation on consumption varies with drug-induced changes in eating motivation (2), the effect of different amounts of deprivation on adaptation might, also, interact with changes in eating motivation induced by different reinforcement

schedules. Such an interactive approach, along with a further concern for the role sex differences play, should provide additional information about the relevant variables in the adjustment of Ss to deprivation conditions.

E. SUMMARY

After initial bar-pressing training, 16 hooded rats were assigned to two reinforcement conditions (CR or FR). Adaptation measures were taken for 12 successive days under conditions of cyclic 23 1/2-hour food deprivation. The results indicated a significant difference in number of bar presses and food consumption for Ss under the two conditions. The significant Reinforcement Groups \times Successive Days interaction effect on bar pressing also indicated that the rate of adaptation for the two groups differed. Since the CR Ss appeared to adjust in nine days (in contrast to previous findings of 15 to 18 days under comparable deprivation conditions), it was suggested that the present Ss benefited from previous training on the adaptation task. The need for further studying the relationship of training and adaptation was stressed and the value of an interactive approach to the study of adaptation indicated.

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ARE THERE STATISTICAL SUPERSTITIONS IN BEHAVIORAL SCIENCE?*

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If one reads some of the more sophisticated research journals or discusses the content of a course in statistics for the behavioral science with certain of his colleagues, one may share this writer's experience of observing a cluster of methodological interpretations that seem to him to be less than fully rational. There are two such attitudinal interpretations he should like to call to the reader's attention that seem to be almost statistical superstitions. Interestingly, it has been the writer's observation that these superstitions—if he may be permitted to call them this—are held by what William James has called the "tough minded" scientist more often than the "tender minded" scientist.

1. *In a test of the null hypothesis regarding a difference between point values, such as means, standard deviations, etc., t or F is superior to, and of more scientific "importance" than, a test of the null hypothesis utilizing product moment correlation, r .* Table 1 presents the values of t and r for rejecting the null hypothesis at the .01 level of confidence.

TABLE 1
EQUIVALENT VALUES OF FISHER'S t -TEST AND PRODUCT MOMENT CORRELATION,
 r , FOR REJECTING THE NULL HYPOTHESIS AT THE .01 LEVEL OF CONFIDENCE

Degree of freedom	Statistic t	r
1	63.657	1.00
5	4.032	.87
10	3.169	.71
100	2.626	.25
1000	2.581	.08
66,351	2.576	.01

Many behavioral scientists would immediately accept the significance, usefulness, and general scientific "importance" of all the tabled t -values in a test of the significance of a difference between means; fewer would accept the

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r -values, especially, $r = .08, .01$. Yet the mathematical proof for r is just as valid as that for t, F , or small sample critical ratios.

An example may help to clarify the issue. The difference between the mean heights of two groups of children might be of the order of magnitude one ten-thousandths (.0001) of an inch—no matter, this difference, if found significant by a t -test, is regarded by many as scientifically important, but a significant r -value of one-hundredth (.01) is not. Also, the scientific "importance" of $r = .01$ as a suppressor variable or as a contributor to the location of a set of orthogonal vectors in a factor-analyzed correlational matrix reaches far beyond simply testing the null hypothesis. r may be much more useful than t in scientific work because of its general utility beyond the testing of null hypotheses regarding relationships between variables.

2. *Tests of the null hypothesis and generalizations from them are sophisticated and advanced levels of scientific endeavor and discovery.* Suppose one can reject the null hypothesis at the .01 level of confidence regarding some point values, such as the difference between two means ($H_0: M_1 - M_2 = 0$). A cautious, rough and general scientific interpretation might be "there is more than nothing here" or "there is something—not much—but probably something here." Thousands of theses, dissertations, and papers have been written in the behavioral sciences whose major emphasis and interpretations rest on tests of null hypotheses regarding point values of this order of significance. Correlation is seen by many as somehow less "acceptable" even though it is more closely related to modern multivalued logic exemplified by the relation $y = f(x)$. On the other hand, small sample critical ratios stated as t or F are primitive and more closely related to the older Aristotelian two-valued logic: accept or reject. F and t are further limited in that they do not permit prediction of phenomenal magnitudes over the whole range of measurements made on nature. Correlation does precisely this.

Still, many behavioral scientists seem to believe that r is less "important" to our science than are small sample critical ratios, that r is old fashioned but t and F are *chic*, that a test of the null hypothesis for point values is the epitome of experimental design and scientific discovery, that . . . Intuition or superstition?

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ANAGRAM SOLVING UNDER CONDITIONS OF LETTER ORDER RANDOMIZATION*¹

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A. INTRODUCTION

Although anagram solving usually requires trial-and-error behavior before the correct solution occurs, there is substantial evidence that the successive attempts to rearrange the anagram letters during the solution process are not random. Instead, this process seems to be, among other things, a function of solution word frequency (1), anagram transition probability (2), solution word transition probability (3), and anagram and solution word letter order (1). In addition it has been suggested that, since certain bigrams and trigrams never occur in English words, it is possible to rule out many potential letter combinations during anagram solving (4). Consequently, these factors seem to produce nonrandom behavior by sharply delimiting the number and nature of letter recombinations that a subject will attempt during the solution process.

In spite of the fact that such nonrandom problem-solving behavior appears to be considerably more efficient than "blind" trial-and-error responding, it nevertheless seems to have the disadvantage of severely narrowing the subject's response repertoire, so that the occurrence of low-probability letter combinations is retarded. It is of interest, therefore, to compare the efficiency of solving anagrams under conditions that favor typical nonrandom behavior, with the efficiency of anagram solving under conditions that favor responding in a more random trial-and-error fashion. Accordingly, in the present study, anagram solving under conditions of artificially produced random letter rearrangements was compared with anagram solving where such experimentally produced randomization of letter orders was absent.

B. METHOD

1. Subjects

The subjects were 20 volunteers from among the engineering personnel of the Radio Corporation of America.

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¹ This article is based upon an investigation which the author conducted at the Missile Electronics and Controls Division of the Radio Corporation of America, Burlington, Massachusetts.

2. *Apparatus and Material*

The problem-solving material consisted of two lists of 10 six-letter, single-solution anagrams which were presented on an automatic typewriter (Friden Flexowriter), activated by a digital computer (RCA Mod II). The use of the typewriter-computer combination provided a convenient system for presenting the anagrams in the form of automatically typed letters, for the random rearrangement of the letters within an anagram, and for automating the timing and scoring requirements of the experiment.

3. *Procedure*

There were two experimental conditions.

Under Condition I, or the *Single Arrangement Condition*, each of the anagrams was presented *only once* for a maximum of three minutes. If an anagram was solved, the next one was presented immediately. If an anagram was not solved within the three-minute time limit, the computer commanded the presentation of the next anagram by the automatic typewriter. The total number of solutions and the time to complete the 10 anagrams in the list were recorded. This condition therefore provided for the presentation of one letter arrangement of each anagram.

Under Condition II, or the *Random Rearrangement Condition*, each anagram was presented for a maximum of twelve 15-second presentations. Typically, the subject worked on the first presentation of the letters for a 15-second interval. If, within this interval, he failed to arrive at the correct solution, a new arrangement of the letters appeared for a second 15-second interval, etc., until the problem was either solved or the twelfth presentation was completed. Each successive presentation of the letters constituted a random rearrangement of their order and was determined solely by the computer. To accomplish this, the computer was programed to present randomly all possible arrangements of the six letters except the one arrangement that represented the actual solution.² Under this condition, the next problem in the list was presented either immediately upon a solution, or upon the subject's failure to solve the preceding problem after the twelfth and final arrangement. By providing for a maximum of twelve 15-second presentations, the total maximum time allotted for the solution of any one anagram was three minutes, and therefore identical in this respect to Condition I.

² The author is indebted to Mr. Ben Scheff for his assistance in programing the computer according to the requirements of the experiment.

All subjects served under both experimental conditions and were required to solve a different list of 10 anagrams under each. Furthermore, to counter-balance the effect of one condition upon the other, half of the subjects served under Condition I followed by Condition II, while the order of presenting the experimental conditions to the remaining subjects was reversed. Regardless of the condition order, however, the anagram lists (List A and List B) were always presented in the same order to all subjects. Consequently, half of the subjects solved List A under Condition I followed by List B under Condition II, while the other half first solved List A under Condition II followed by List B under Condition I.

C. RESULTS AND DISCUSSION

The means and *SDs* for the experimental conditions on each of the performance measures are presented in Table 1. The correlated *t*-value with respect to the mean number of anagrams solved was 3.94 ($df = 19$, $p < .001$), while the *t* obtained by comparing time scores was 2.24 ($df = 19$, $p < .05$).

TABLE 1
COMPARISON OF MEANS AND *SDs* FOR THE TWO EXPERIMENTAL CONDITIONS

Condition	Number of anagrams solved		Minutes to complete anagram list	
	Mean	<i>SD</i>	Mean	<i>SD</i>
Single Arrangement	5.35	2.35	19.78	5.09
Random Rearrangement	7.00	1.64	17.94	5.01

These results clearly indicate the superiority of the Random Rearrangement Condition, since it produced a significantly greater number of solutions in a significantly shorter period of time.

It is possible to conclude, therefore, that the rearrangement of anagram letters in a completely random fashion facilitates problem solution. Of course, since such blind recombinations, unless artificially produced, do not ordinarily occur because of the behavioral restrictions established by the well developed verbal habits of the solver, it appears that he cannot be maximally efficient under ordinary solving conditions. Hence, the findings of the present study lead to the somewhat paradoxical suggestion that the solver's inability to engage in random trial-and-error behavior, due to his apparent pursuit of hypotheses based upon his knowledge of the structure of English words, retards rather than facilitates his performance.

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THE DEVELOPMENT AND TRYOUT OF A LABORATORY PROCEDURE FOR INDUCING PHYSICAL THREAT STRESS*¹

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A. INTRODUCTION

This paper is concerned with the development of a laboratory procedure to induce stress of a physical threat nature, and with observational evidence that the procedure did actually produce physical threat stress. To the author's knowledge, the procedures developed were more effective in producing stress in a laboratory than any that have been reported in the psychological literature. Further, the experimentation was clearly based on psychological analysis of stress and thus meets Lazarus' (9) well taken criticism that most of the experiments performed on stress have ignored the question of psychological process and have served merely to demonstrate that a given stimulus condition results in some reaction termed a stress reaction. In truth, it is the psychological process that is of primary concern in this paper. After a brief description and introduction to the experiment, the procedures for inducing stress are described, and the tryout of the procedures on a number of subjects is discussed along with an analysis of subject reactions to the threat.²

B. PROCEDURES

1. *Rationales*

In earlier studies, over two thousand incidents of performance impairment under stressful operational conditions in flying aircraft have been analyzed. These analyses formed the basis for the development of the stress-inducing techniques and for the selection of the accompanying measures of performance impairment used in this study.

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² The statistical analysis of the test data is being reported elsewhere.

2. *The Task Complex*

The tasks to be performed were integrated into a complex performance situation in order to be more realistically similar to the inflight operation of an aircraft. The tasks included three psychomotor tasks described by Melton (11): the Complex Coordination Test, the Motor Judgment Test, and the Direction Control Test. One of these three tests was in operation at all times during a testing session. In addition, two Vigilance tests requiring spotting and reporting of key patterns in a changing setting and a Math Problem Programmer completed the task complex. All tasks were grouped together in a small enclosure and the subject was seated, belted in, and the door shut. The tasks were operated, after a brief training session, in four 30-minute "missions" according to a fixed schedule. The first of these was a nonstress mission, followed by two stress missions; and, finally, a nonstress mission completed the experimental session. The missions were completed at one sitting, requiring work for half a day on the part of the subject. Subjects were divided randomly into control and experimental groups. Experimental groups received the stress conditions (to be described below), while control groups performed in the same task sequences without the stress conditions.

3. *The Development of Stressful Conditions*

In the above mentioned previous studies, nine important physical threat stresses found to be occurring operationally in flying airplanes had been identified. These are shown, along with the percentage of occurrence in the critical incidents analyzed, in Table 1. These stresses were translated into laboratory procedures according to a rather lengthy process of rational and psychological analysis.

A four-point procedure was employed:

1. Describe the objective facts concerning operational situation.
2. Develop inferences concerning psychological aspects of these situations based on the objective facts and the findings of studies.
3. Describe how these psychological aspects or conditions might be simulated in the laboratory.
4. Develop specific laboratory situations in line with the established psychological requirements.

Operationally, the procedure consisted of analyzing the threatening incidents to attempt to find communalities underlying them. Inferences were then made regarding the psychological consequences and characteristics of these common dimensions, and further inferences then led to specification of laboratory procedures that might tap the same psychological dimensions.

TABLE 1
STRESS CATEGORIES AND PERCENTAGE OCCURRENCE IN A GROUP OF 2000 INCIDENTS

Stress	Percentage
A. Physical threat stresses	
1. Weather	15
2. Mechanical malfunction	13
3. Enemy action	12
4. Collision, crash, bailout	6
5. Low on fuel, lost, overloaded	4
6. Hazardous terrain	3
7. Fire or danger of fire	3
8. Recent accident	3
9. Formation flying	1
B. Social-evaluative stresses	
1. Check flight, errors (presence of high ranking personnel, evaluation and errors of self and others)	7
2. Poor supervision	3
3. Personal problems	3
4. Responsibility (for good job, welfare of others)	1
C. Physiological stresses	
1. Physiological excesses	15
a. Prolonged fatigue	(6)
b. Lack of sleep	(2)
c. General fatigue	(2)
d. Others (accounting for less than 1% each) (cold, heat, cramped, hunger, anoxia, sickness, hangover)	(5)
2. Long flight	10

Lazarus (9) has noted that a common psychological element in stress is the *anticipation* of something harmful in the future and the interpretation of the personal significance of that something. This is the key to the concept of *threat* which he regards as the intervening variable in psychological stress (9, p. 200). However, in addition to the common element of anticipatory fear found to be associated with all situations, there were other conditions or dimensions which occurred in varying degrees depending upon the specific operational situation. Five such dimensions were identified:

1. Strength of threat, or the degree of seriousness of the situation as perceived;
2. Informational feedback, or the degree to which the individual could check on the adequacy of his performance relative to the situation;
3. Knowledge of the outcome, or the information that the individual had about the chances of actually being harmed or getting out of the situation;
4. The effect of performance on the outcome, or the amount of control that the individual had on the outcome of the situation through his own actions;
5. The temporal qualities of the situation, or the imminence of the physical threat and its perceived potential duration.

These dimensions are essentially cognitive aspects of a threat situation and the provision of information regarding them supplies what Berkun *et al.* (4) have referred to as a "cognitive stimulus" designed to counteract the "cognitive defenses" of the subjects.

The above evaluations led to the specification of a number of criteria for simulating physical threat conditions in the laboratory. These are as follows:

1. Effectiveness and realism as a physically threatening situation.
2. Effectiveness as an anxiety or fear-producing situation.
3. Generality of effectiveness for a large number of subjects.
4. Repeatability with the same and different subjects without loss of effectiveness.
5. Ethical propriety with respect to traumatic effect on subjects.
6. Administrative feasibility with respect to cost, time, equipment, space, staff.
7. Realism of the entire situation, both stress and task performance.

4. Subjects

The subjects were paid Air Force ROTC volunteers from colleges in the Washington, D. C., area. Upon reporting to the examination room, each subject was briefed as to the nature and importance of the project and given a pair of fatigues to wear during the conduct of the experiment. He then underwent the training sessions and proceeded right into the four missions described above. Each subject had received a recent physical examination and was pronounced in excellent health, and all subjects were given the opportunity to withdraw from the experiment if they felt that they could not continue. All precautions against any physical mishap were taken.

C. DESCRIPTION OF THE LABORATORY PROCEDURES FOR INDUCING STRESS

Of course, the major problem in creating physical threat in a laboratory lies in the fact that the subject knows that you cannot ethically or morally produce a situation that will really harm him. Berkun *et al.* (4) have termed this "cognitive defense." As mentioned above, Berkun favored attacking this problem through the use of cognitive stimuli leading to a conclusion that the subject is being threatened, while Lazarus has emphasized the importance of anticipatory fear which may or may not be cognitively based. The present research attempted to apply both of these principles. In reality, the problem was to produce a situation in which the subject forgets temporarily that you can not really harm him. Thus, the situation must create excitement, a very

strong preoccupation with the ongoing activity, and an intense desire to avoid the stressors.

1. *The Stress Programmer*

In order to provide information about the "cognitive" dimension of stress, a visual informational device was developed to present to the subject inputs regarding each of the five stress dimensions listed above. This device was called a Stress Programmer and occupied a prominent place in the enclosure in which the subject was placed. The Stress Programmer consisted of five rows of lights (see Figure 1). The information was presented to the subject

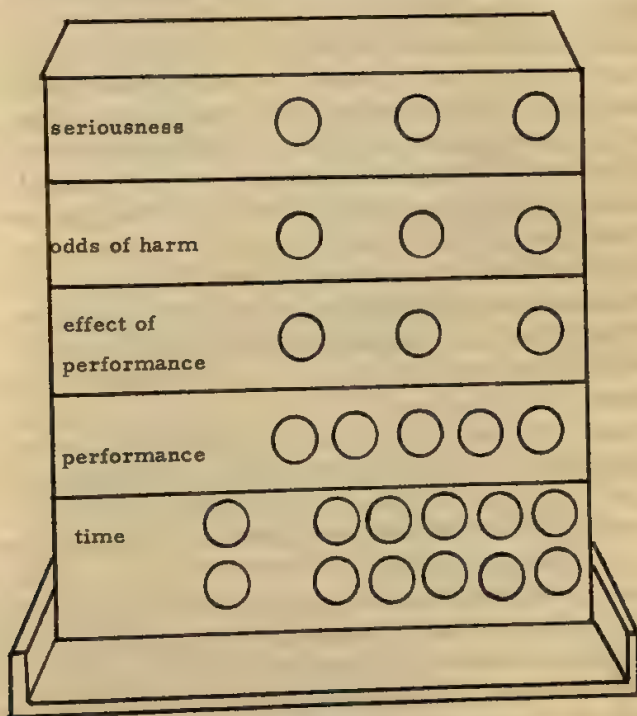


FIGURE 1
STRESS PROGRAMMER

by means of the number of lights that were lit at any time during the experimental program. The more lights lit, the more important the dimension at that particular moment in time. Subjects received extensive instruction on the interpretation and meaning of the Stress Programmer.

2. *Electric Shock*

The main stressor, one which appeared to meet all of the criteria specified for physical threat in the laboratory, was electric shock. However, it was necessary for the shock to be sufficiently painful and sufficiently dramatic and impressive to create the necessary overriding anticipatory fear and anxiety. It is on this point that many stress studies are deficient [e.g., Heilbrun (7)]. On the other hand, it was also necessary for the shock to be safe and not to interfere with the subject's operation of the "aircraft": i.e., the tasks to be performed. Shock was applied through electrodes fastened to the upper left arm of the subject, one electrode on top of the upper left arm, the other on the bottom. Thus, the path of the shock, being a short, direct path through the upper arm, involved no vital organs. Electrode jelly was used with each electrode to insure a good contact, and electrodes were fastened to the subject's arm by means of an elastic bandage which was wrapped around the subject's arm. The shocking device was a Phipps and Bird Inductorium, operated by several dry cells. The output of the shock device was maintained at approximately three milliamperes, and was adjusted individually for each subject to allow for differential resistance. The length of shocks varied according to a schedule from one to six seconds. [Pervin (12) has recently used a similar arrangement, though with much shorter shock durations, to study predictability of threat.] The output was intensely painful, as can be witnessed by the author, who played "guinea pig" in the development of the details of this situation.

While the electric shock served as a noxious device, creating pain and anticipatory anxiety, it was felt that an additional feature was necessary in order to produce a more dramatic, immediate fear. Therefore, a Tesla Coil was constructed, the electrodes for which projected through the roof of the enclosure to a point approximately 12 inches in front and slightly above the subject's face. The Tesla Coil was so constructed that the application of ordinary 117-volt house current produced a voltage differential of approximately 250,000 volts across the electrodes. This voltage differential resulted in a crackling blue spark of approximately five to six inches in length across the electrodes in front of the subject. The onset and duration of this spark was precisely keyed to the onset and duration of the shock applied to the subject's upper arm, and provided a dramatic visual display complete with a loud crackling noise which the subject apparently generalized to what was happening to his arm. Subjects were told of the voltage in question and instructed firmly to keep their hands out of the spark gap area. (The author hastens to add that in reality the device was perfectly safe. Inserting one's

hands in the spark gap momentarily would produce no ill effects, since the generation of such extremely high voltage by means of induction coils produces a corresponding drop in amperage.)

In summary, the stressful conditions included the following:

1. Instructions and statements by the experimenters of the seriousness and the importance of performing well and of the danger involved in the shock;
2. The visual information device designed to provide information as to the seriousness, imminence, etc., of physical threat;
3. A very painful, though not dangerous, electric shock accompanied by a very dramatic visual and auditory electrical display.

D. THE TRYOUT OF THE STRESSFUL CONDITIONS

The objective of the present study was to produce a laboratory situation in which subjects would (a) actually temporarily forget that experimenters could not do them damage and (b) really become physically threatened. The tryout of the above described conditions on subjects produced behaviors which suggested that these aims were successfully accomplished.

1. *Initial Reaction and Commitment*

During the initial period of testing (nonstress), the subjects appeared interested and motivated; they rapidly acquired a reasonable proficiency in organizing and handling the complex of tasks. The initial shock, however, produced dramatic reactions, and all subjects gave some oral evidence of discomfiture, such as remarks or comments. There were other evidences of immediate fear. These included obvious postural tension, nervousness, wiping of the hands, mumbling, frequent glances around at the experimenters with worried looks, etc. Heavy perspiration was observed; breathing became markedly heavier and more rapid and became quite audible through the throat microphones. Virtually all subjects asked questions about the nature of the situation and how their performance would relate to it. Some asked if they had been doing something wrong, and some reported difficulty in concentrating and initial confusion. It might be said that the initial reaction appeared similar to the "alarm reaction" postulated by Selye (14), which features a general state of bodily tension and readiness.

From these reactions it appears that the subjects attempted to define the situation and to assess the extent of the threat by asking questions concerning the magnitude of the shock, and how the shock might be related to other aspects of the situation (primarily to their performance). Not only the content, but the manner of asking the questions indicated concern with imposing

some organization on the situation, and also indicated an attempt to establish some hypothesis as to the most effective behavior to be used. Thus, in line with Pervin's (12) finding that predictability of the threatening stimulus reduces anxiety, it appeared that the subjects attempted to fit this obvious threat into a definite scheme of things, and to define possible relationships and results in order to reduce the psychological impact of the threat.

It was clear that, after the initial shock, many subjects went through a process of interpretation of the threat in terms of its severity and the probability that they might be able to master the situation. (In the postexperimental debriefing session, a number of subjects reported having considered at this point whether to quit or stick it out.) Their comments after the initial shock also showed a strong tendency to evaluate the situation in terms of whether or not they believed that their performance would be sufficient for them to avoid the major impact of the stressors. Underlying this appeared to be the feeling that "they wouldn't really dare to hurt me" (Berkun's "cognitive defense").

As the first stress mission continued and several more shocks occurred (the sequence and the severity of the stressors were standardized and not related to performance, although subjects were not aware of this), almost all subjects found the situation highly unpleasant. One may ask why most subjects completed the experiment, since as volunteers they would not have been compelled to stay. (A few subjects did find the situation so stressful that they insisted on quitting.) It seems reasonable to hypothesize that most subjects were motivated to remain because "escape" was presented by the experimenters as unacceptable behavior, equivalent to cowardice, and contrary to normal performance. Thus, a subject had to consider the acceptability of escape to himself. If he found the situation less threatening than the threat associated with loss of self-acceptance produced by leaving the situation without finishing the session, then he stayed. If, on the other hand, he could convince himself of the acceptability of asking to leave the situation, then he did so. If approval were to have been given for leaving the situation, the subjects would probably have left immediately. Although they might have been uncomfortable about some loss of self-acceptance through this action, the acceptance by the experimenter of their behavior would have relieved some of their discomfort. However, the experimenter steadfastly refused to condone such behavior, forcing the subjects who wished to quit to do so entirely on their own. Even those whose standards would not let them ask to leave directly gave many indirect indications of asking the experimenter for approval for quitting. Some of these

behaviors included piteous cries, calls for mercy, pained looks, and exaggerated reactions to call attention to their plight.

After initial conflict as to whether or not they should stay in the situation and try to stick it out, it seemed that most subjects committed themselves to the situation in a rather interesting fashion. Having decided that leaving the situation was an unacceptable behavior, they seemed to resign themselves to the situation to an unusually high degree. This decision seemed to be based on the hypothesis that the situation was one that could be mastered by means of an adaptive strategy (indicated by debriefing comments, such as, "I'll work very hard and do well and then I'll get no shock," and "My best bet is to follow all the instructions and try to improve," etc.). And, in fact, during the early portions of the experimental period subjects appeared to concentrate *very* strongly on performing well. The experimenters noted initial improvements in performance in many cases. However, the process of commitment to what was evaluated as an adaptive strategy by the subject seemed to reduce the subject's ability to re-evaluate the situation as he went along. Since it soon became evident to the subject that he was not succeeding in avoiding the (standardized) stressful conditions, it was necessary for him to re-evaluate and restructure his performance in the situation in order to try other strategies that might produce a more acceptable result. In this re-evaluation process, it appeared that the alternative of leaving the situation was much less probable than it had been originally. In other words, the original commitment to the situation tended to hold, even in the face of increasing evidence of the subject's failure to avoid the stressors.

As the situation progressed and the frequency and the intensity of the stressful conditions were not reduced, there was evidence that the subjects re-evaluated their tactics, both from observations of changing methods of handling the situation and from the postexperimental reports of the subjects themselves. This reorganization and re-evaluation was probably interfered with considerably by anxiety resulting from failure to be able to deal with the situation. Such anxiety appeared to have a major impact on ability to perform under stress: anxiety tends to be focused on concern for the phenomenal self, and thus attention was drawn inward into channels which were ineffectual performance-wise, leaving less attention potential available for dealing with the situation and producing a decrease in the ability of the subject to handle the external situation effectively. Some subjects reported just such introversions of attention in their postexperimental interviews. It would appear that this mechanism may be a key explanation for the per-

formance impairment which occurred, particularly with respect to the time shared and less attention-demanding monitoring tasks which were impaired more greatly than the visual manipulative tasks. This is in line with certain results in the literature [see Lantz (8), Beier (3), and Cowen (5)] who found similar tests impaired under stressful conditions. Some support for this view is also found in the work of Bartlett (2), who found that anticipation span dropped and subjects reacted only to immediate stimuli.

2. *Progressive Breakdown of Functioning*

The stressful conditions in the present situation were sufficiently potent that it was possible to observe a progressive breakdown of function in a number of the subjects. The first stage appeared to be an adaptive sort of behavior, one exhibited by essentially all subjects, in which the efforts of the subject were devoted to the task of improving performance so that the stressful conditions would not be experienced. Such adaptive behaviors, of course, were simultaneously protective to the subjects in that they relieved the subjects of the severe disapproval which they felt would occur if they failed to perform. Thus, the adaptive behaviors then were directed not only at the avoidance of the direct stressors, but also at the avoidance of disapproval which might be incumbent on quitting or doing poorly in the situation.

The second stage seemed to be what we might term overwrought, marginally adaptive behaviors. These might be described as the utilization of essentially adaptive approaches in an essentially nonadaptive manner, and were characterized by the excessive and wasteful expenditure of effort and energy and an excited and overimaginative approach to the situation. These observations correspond with those of Sherman and Jost (15) and others who have found increases in overt and disorganized activity during performance under stress. Virtually all subjects in the present experiment exhibited a great amount of such excited, nervous, and tense expenditure of effort and energy as the experimental situation progressed.

A further stage in the progressive breakdown of function which was observed in most subjects in the present experiment included nonadaptive behaviors which were apparently functioning as preservative and defensive to the integrity of the organism. These behaviors included kicking, yelling, stamping, getting mad at the experimenters, stating that the machines were not functioning properly, protestations, arguments, getting sick, requesting to be allowed to quit, and actively refusing to operate the equipment accompanied by "unshakable" demands to be let out. Freeman and Pathman (6) also found that subjects who worked off aroused energies in overt activity, even if such activity

was nonadaptive to the task at hand, recovered their equilibrium more rapidly than those subjects who did not. Thus, it appeared that such nonadaptive behaviors might have protected the organism by keeping awareness of the severity of the experimental conditions to a minimum even though they did not contribute to the improvement of test performance. A good example of this type of activity was the behavior of one subject who screamed at the top of his voice, stamped his feet, and beat his hand against the wall of the enclosure, literally until his knuckles were bloody, as long as the shock was on, and who returned immediately to the performance at hand as soon as the shock was terminated.

The final breakdown stage which ensued with several subjects was characterized by withdrawal and loss of contact with the situation, loss of functioning, and regression to primitive emotion. Three subjects displayed such reactions progressively to an end state in which they were reduced to complete inability to respond to the situation in any way. These persons just sat and sobbed through approximately the latter half of the experimental period, showing no visible reactions either to shock or to the performance demands of the situation.

Once again, it is important to note the extent of the commitment to the situation which was developed by the subject. Although the experimental conditions appeared to have been extremely successful in producing physical threat stress, once the subject had decided that he would participate (for whatever reason), the probability of re-evaluating this decision apparently decreased progressively. The author is convinced that in the case of some of the subjects in this experiment, it would literally have been possible to kill them before they would have left the situation. The psychological implications of this degree of commitment to a situation constitute one of the most interesting aspects of the study.

The progressive breakdown of function observed in this experiment corresponds very well to the observations made by Rioch (13) in his experiments with cats. These experiments suggested that under conditions of continued stress and continued lack of success in dealing with it, an organism exhausts its response repertory and reaches a state of breakdown. Apparently the organism proceeds through several step-like planes of decreasingly adaptive function, corresponding to those suggested by Ashby (1) and similar to Lewin's (10) sequence of quasistationary equilibria. The subject may offer one or more responses at each level before behavior assumes a new level through the introduction of new or more stringent conditions of the increase of anxiety. The length of time spent at each level and the length of time to reach the breakdown stage are probably functions of the extent of the orga-

nism's response repertory at each level, the severity of the threat as perceived by the organism, and the temporal duration of the threat.

E. SUMMARY

In summary, this paper has described the development of laboratory procedure for inducing stress of a physical threat nature at a very high level. The development of the situation was described in terms of the rationale underlying it. The laboratory implementation of the situation including its tryout with a group of subjects was described. The observed behaviors and reactions of the subjects to the situation were noted, and some inferences and hypotheses regarding performance under stressful conditions were stated.

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STATISTICAL INFERENCE FROM $N = 1$ EXPERIMENTS*

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A. INTRODUCTION

Dukes (1) quite effectively demonstrated, by argument and examples of published research, the value of studies of only one individual. In spite of the value of such studies, very few experiments published in recent years have been based on the study of only one subject. This is not surprising because editors expect experimental results to be evaluated by statistical tests, and there is no guide for the application of a statistical test to repeated measurements on one subject. Perhaps the primary reason statistics books ignore the problem of the application of significance tests to such data is that one subject provides no estimate of the population variability and consequently no basis for statistical inference about the population from which the subject was selected.

The belief that you cannot statistically generalize to a population of individuals on the basis of measurements from only one subject is certainly correct. However, it is also correct that you cannot statistically generalize to a population from which you have not taken a random sample, and this fact rules out statistical generalization to a population (at least to a population of some importance) for virtually all psychological experiments, those with large samples or small (2). In the absence of random samples, hypothesis testing is still possible, but the significance statements are restricted to the effect of the experimental treatments on the subjects actually used in the experiment, generalization to other individuals being based on logical, nonstatistical considerations. In this article it will be shown that significance statements also can be made about the effect of experimental treatments on a particular individual when he is the only subject.

B. STATISTICAL ANALYSIS OF REPEATED MEASUREMENTS FROM ONE SUBJECT

It must be emphasized that the following hypothesis-testing procedure does not require random sampling and consequently should not be judged in

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the light of the conventional random-sampling approach to hypothesis testing. No assumption is made about random sampling of either individuals or responses; our subject is deliberately selected and instead of taking a random sample of his responses we take whatever responses he makes.

Consider an experiment with two treatments, A and B, in which we predict that our subject will perform better under A than under B. Each treatment will be given six times. We use a randomization procedure to determine the order in which the treatments will be given. The null hypothesis is that the treatments have identical effects: i.e., the individual's response to each treatment administration is the same as it would have been if the other treatment had been given instead of the one actually given at that time. Suppose we obtained the following results, listed in the order in which the treatments were given:

A	B	B	A	B	A	A	B	A	B	A	B
17	14	15	17	14	19	21	16	20	16	20	18

Under the null hypothesis, any difference between the performance under the two treatments is due solely to a difference in the times at which the two treatments were given. Since the order of administration of treatments is randomized, the null hypothesis attributes large differences between treatments to the chance assignment of one treatment rather than the other to the various times of administration. To test the null hypothesis, then, we consider the sampling distribution of differences between the treatments under every equally likely assignment of six As and six Bs to the 12 obtained measurement values to determine how rarely we would get a difference in favor of the A treatment as large as the obtained difference. This sampling distribution has already been derived for the Mann-Whitney *U* statistic, so we use the *U* statistic as our measure of difference. The obtained *U* is 2 and the probability tables (4, p. 271) give a probability of .004 for such a small *U*. Therefore, we reject the null hypothesis at the .01 level of significance and accept the alternative hypothesis that treatment A was more effective than treatment B. More precisely, the alternative hypothesis is that for some (perhaps all) of the administration times an A treatment would have been more effective than the B treatment actually given or a B treatment would have been less effective than the A treatment actually given.

Inspection of the series of 12 performance measurements reveals a tendency within each type of treatment for the later measurements to be larger, the same sort of tendency that is associated with practice effects in the early stages of learning. The existence of this tendency has no effect on the validity

of the significance test described because the random assignment of treatments to various times of administration randomizes any beneficial or detrimental effects on performance associated with the time of administration, and the significance test takes this randomization into account.

The application of the Mann-Whitney U test was considered in the above example, but exact randomization tests or parametric tests (used as approximations to randomization tests) are alternative procedures (2). However, it should be realized that in applying a t -test to such data, a comparison of the means is simply an indirect way of testing the null hypothesis of identical treatment effects, *not* the null hypothesis of identical *mean* effects.

If the treatments are given so close together that the response to a treatment is affected by the preceding treatment administration, we cannot draw inferences about treatment differences that might exist for treatment administrations isolated from earlier administrations. But this problem also exists with large samples and, as Lindquist (3, p. 163) points out, is not solved by using all possible orders to "balance out" the effect of earlier treatment administrations. For example, if a B treatment enhanced the response to the subsequent A treatment more than an A treatment did to the subsequent B treatment, averaging over all orders could still yield a significant difference in favor of the A treatment even if there were no treatment differences with isolation of treatment administrations.

Another source of difficulty in interpreting a significant difference between treatments for one individual, in some experiments, is the possibility that the obtained difference is the result of the individual's attitude or expectation regarding the experiment. We should try to eliminate this source of error—e.g., by concealing the purpose of the experiment or by using naive subjects—but here again we find that the same problem exists for large samples. There may be no good reason to assume that the directional effect of the attitudes varies from subject to subject in such a way that the overall average effect is zero; in fact, in many cases it is reasonable to assume a similar direction of bias in almost all of the subjects.

C. REPLICATION OF $N = 1$ EXPERIMENTS

In $N = 1$ experiments, as in most large sample experiments, inferences about individuals not used in the experiment must be made on a nonstatistical basis by considering which characteristics of the subject are likely to be relevant to the experimental outcome. Certain characteristics may be recognized as irrelevant, but there may be a number of characteristics whose relevance is unknown. For example, in a sensory perception experiment, the sex, intelli-

gence, and visual acuity of the subject may be important variables. Since our one subject has only one sex, level of intelligence, and degree of visual acuity, we cannot infer how persons who differ in these characteristics would perform.

In order to get evidence regarding the relevance of certain characteristics to the experimental outcome, we can carry out replications with other subjects, obtaining enough measurements from each subject to determine the significance of the difference between treatments for that subject. For these replications we should select subjects that differ with regard to the characteristics under investigation. For example, if our first subject in the perception experiment was a male with poor vision and high intelligence, we should replicate with a female with poor vision and high intelligence, a male with good vision and high intelligence, and a male with poor vision and low intelligence. Of course, if we want to consider the possibility of these characteristics interacting in their influence on the experimental outcome, we should also replicate with other combinations of sex, vision, and intelligence.

D. REPLICATION OF SINGLE MEASUREMENTS OVER SUBJECTS

There are situations in which it is necessary to have more than one subject in order to get the measurements needed for a significance test. For example, treatments may be mutually exclusive, such as raising an animal in darkness or raising it under normal conditions of lighting, making it impossible to submit the same animal to both treatments.

The following procedure for experiments involving one measurement from each of a number of subjects differs from the customary random sampling procedure because this procedure is intended to permit *statistical* inferences about treatment effects on the experimental subjects and to facilitate *nonstatistical* inferences about other individuals; once again, there is no assumption of random sampling.

We randomly assign a number of subjects to each experimental treatment. The statistical test is carried out in the same way as with repeated measurements from one subject and the null hypothesis tested is that every measurement is the same as it would have been if the other treatment had been given instead of the treatment actually given. Rejection of the null hypothesis implies acceptance of the hypothesis that the measurements are not the same as they would have been under the other treatment, but since we cannot identify the measurements which would have been different we cannot determine which subjects would have responded differently. Consequently, if our subjects differ considerably from each other with regard to several characteristics, we cannot have a very definite idea of the type of individual to which we can

generalize. In order to avoid this ambiguity we should select subjects who are homogeneous with regard to characteristics whose relevance we want to investigate. Suppose our first group of subjects were young males and that we obtained a significant difference between treatments. We can then determine whether age and sex are important variables by replicating the experiment with a group of old males, a group of young females, and a group of old females, each of these groups being statistically analyzed separately.

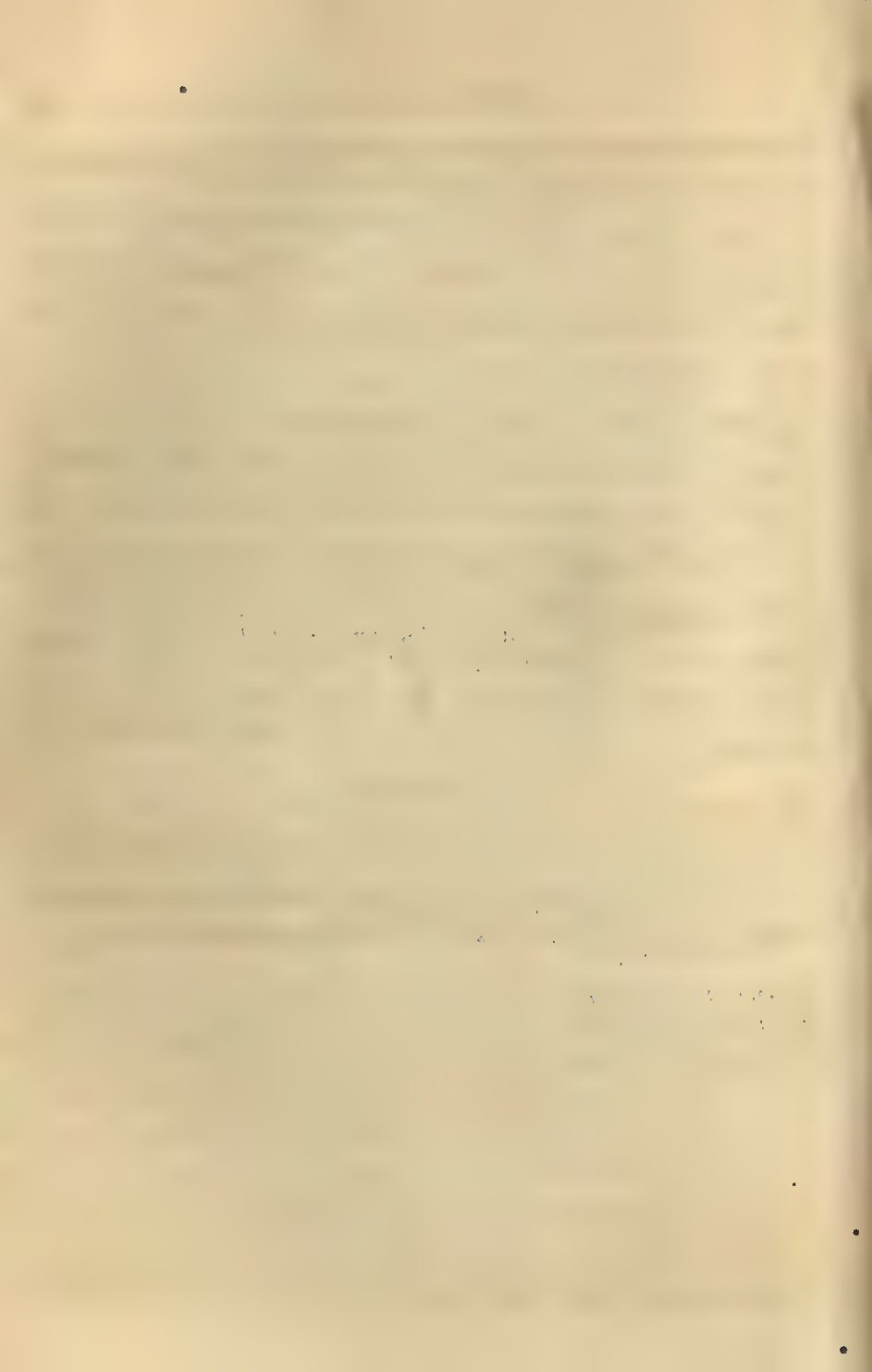
E. SUMMARY

Although the value of $N = 1$ experiments has been recognized, very few experiments in recent years have been based on the study of only one subject. Perhaps the main reason for this is that editors expect experimental results to be evaluated by statistical tests and there is no guide for statistical evaluation of repeated measurements on one subject. To help alleviate this problem, a rationale is provided for testing the significance of a difference between treatments for an individual. The proposed hypothesis-testing procedure differs from the conventional random sampling approach to hypothesis testing in several respects. It tests the null hypothesis of identical treatment effects, *not* the null hypothesis of identical *mean* effects, and it does not involve assumptions of random sampling of a population of individuals or a population of responses.

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A NEW TECHNIQUE FOR THE SYSTEMATIC DESENSITIZATION OF PERVASIVE ANXIETY AND PHOBIC REACTIONS*¹

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A. INTRODUCTION

Behavior therapists using reciprocal inhibition methods involving direct retraining or desensitization at the imaginary level have reported a number of limitations and difficulties. Meyer and Crisp (4), for example, have cited the following problems:

1. Practical retraining can become tedious and time consuming when the anxiety-eliciting stimuli are of a complex nature.
2. Some patients consider the whole process of desensitization on an imaginary level artificial, and hence fail to respond with anxiety to the graded stimuli presented.
3. Even when they respond favorably, some patients fail to generalize from therapeutic to real life situations.
4. Patients reporting anxiety may sometimes be unreliable. They may not report anxiety when they show its physical signs and *vice versa*.

The aim of this paper is to present a new, more flexible technique for systematic desensitization at the imaginary level, in which the patient takes a more active role in the therapeutic process. This technique, when further developed, may help to overcome some of the problems mentioned above.

B. CASE REPORT

The patient was a 24-year-old married Moroccan female, admitted in 1965 as an inpatient to the Neuro-Psychiatric Section of the University of Rabat's Teaching Hospital, Morocco. She was complaining of acute generalized anxiety and feelings of inadequacy and depression, certain phobic reactions concerning death, disease, and blood, a number of hypochondriacal symptoms, and a distinctive mouth tic.

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¹ The author wishes to express his gratitude to Dr. H. Habib, Chief Psychotherapist in Al-Ghazi Mental Hospital, Morocco; and Dr. V. Meyer, Dr. A. H. Crisp, and Dr. J. M. Mair of the Department of Psychiatry, Middlesex Hospital.

The patient was the eldest of three children, two of whom were boys. As a child, she was greatly terrified by her father whom she described as an authoritative, aggressive, and nagging person. He used to brutalize her mother even for trivial matters concerning his home comforts. The mother responded with self-pity and often complained of her misery to the patient, who was still a child, telling her that she feared her father's cruelty to her might "end her life" or give her some incapacitating disease. Failing to get a divorce, the mother took her youngest son and left the house. The patient and her younger brother were cared for by an elderly female relative and later by their stepmother. After her mother's escape, her father subjected the patient to a number of frustrating experiences to which she reacted with nonassertive and intropunitive behavior. However, there were infrequent moments in which he showed his genuine love and concern for her.

The patient managed to finish school and secured a clerical job in one of the Government's offices. At the age of 18, the father thought it was time she got married and selected² a "suitable" young man for the purpose. She was fairly happy during the first few months of her married life. She experienced sexual gratification for the first time and enjoyed some sort of semi-independent life. However, she later discovered the young husband to be domineering, sexually overdemanding (even during pregnancy), economically dependent on her salary, and extremely jealous. She developed her first mild attack of depression after her first baby was born. Thereafter, she had some unfortunate sexual experiences with her supervisor at work, which she could have avoided had it not been for her introverted highly submissive personality. This made her feel very guilty and unhappy.

During the childbirth of another baby she lost much blood and, before completely regaining her physical health, she developed the psychological complaints mentioned earlier. She stayed in the hospital for four months during which she failed to respond to psychoanalytic treatment and antidepressant drugs and was unable to socialize with other patients in the ward. Her condition in fact was apparently getting worse, so her father and husband decided to take her to a Moroccan "native psychotherapist"³ whose efforts only succeeded in intensifying her feelings of guilt and inadequacy. She was readmitted to the hospital and her therapist continued drug treatment, daily sessions of relaxation, and weekly sessions of group therapy to which she responded with

² This practice is not uncommon among certain social classes in the Arab world.

³ These are native "medicine men" who claim to use religious therapy, but in fact utilize primitive methods combining witchcraft, physical punishment, suggestion, and native herbs for drugs.

obvious passivity. In midAugust, 1965, the patient was referred to the author for some form of behavior therapy.

C. TREATMENT

1. *Plan of Treatment*

The decision was made to begin the treatment with the desensitization of anxiety stimulated by social interaction with dominant males, and then to give the patient practical retraining in assertive behavior, rather than starting with the treatment of the phobic reactions, the hypochondriacal symptoms, and the mouth tic. It was postulated that these overt symptoms, which appeared after the general anxiety and depression, could be viewed as higher order conditioned responses elicited by this general conditioned anxiety, which was in turn generated by her nonassertive intropunitive behavior in the face of hostility emitted by dominant males. The hope was that by treating the Conditioned Anxiety Drive the patient might recover from some of her phobias and other overt symptoms, or at least have their severity reduced.

To establish rapport and motivate the patient for the course of treatment, it seemed appropriate to make a few reinterpretations for some of her guilt-provoking incidents and her consequent responses to them. Some of this was done in the light of the Islamic concept of sin forgiveness. The patient was partly relieved and felt optimistic about the possible success of treatment. At this point the rationale of reciprocal inhibition by systematic desensitization was explained to her. Three hierarchies of anxiety-provoking stimuli relating to her father, husband, and supervisor were constructed. The aim of treatment at this stage was to inhibit anxiety generated by their hostile behavior and fear of emitting assertive responses to deal with this hostility. For example, the following are scenes from the hierarchy developed to inhibit anxiety provoked by the husband:

1. Husband comes home in a bad mood because of a nondomestic problem.
2. Husband slightly disturbed by a trivial matter caused by patient:
e.g., food is not ready on time.
3. Husband angry because of problem concerning their elder son.
4. Husband making devaluating comments.
5. Husband being sarcastic.
6. Husband nagging.
7. Husband losing his temper and shouting bad names.
- ...
11. Husband demanding money needed by the patient.
12. Husband demanding sexual intercourse when desire not reciprocated by patient.

After all the noxious stimuli were placed in their respective hierarchies, the hierarchies themselves were arranged in the order of difficulty according to the patient's reported anxiety. Treatment began with the father's hierarchy, then with the husband's, and lastly with the supervisor's.

2. Execution of Treatment

It is the execution of treatment that forms the main contribution of this paper. The technique of reciprocal inhibition followed was essentially based on Wolpe's (5) method of desensitization on the imaginary level. However, instead of instructing the relaxed patient to imagine a scene, for a fixed time, from the spoken words of the therapist, our patient was asked to emit the verbal behavior herself and the treatment pursued a more flexible course.

To begin an interview, the therapist would relax the patient, using Jacobson's (2) technique, and then ask her to imagine a few "neutral" scenes concerning the first item in the hierarchy to help bring about an atmosphere conducive to imagination and desensitization. From then onward, the patient, who had been instructed to stop talking and give a specific signal as soon as she felt or anticipated much anxiety, would take the lead and verbalize her imagined scenes. So long as she was fully relaxed, she was allowed to digress from the originally planned scenes, but the therapist would intervene from time to time to reactivate the process of imagination, and to guide the verbal behavior in a *flexible* manner, along the planned course of the hierarchy. For example, in going over the eleventh scene of the first theme in the first hierarchy, the patient was instructed to imagine and talk about a certain incident in which the father lost his temper. When this scene ceased to produce any anxiety, the patient was allowed to wander freely, at a horizontal level, so to speak, imagining and verbalizing a number of similar scenes in which the father had lost his temper in various social situations concerning her or another member of the family.

As soon as the patient felt or anticipated much anxiety and consequently stopped talking, the therapist would intervene and make supportive remarks, take her back to an earlier point in the hierarchy, or represent the noxious stimulus in a more graded fashion so that she could overcome her emotional obstacle. Although anxiety was generally reported when going up the hierarchy, it was infrequently evoked by a "horizontal scene."

This latter type of anxiety was sometimes caused by associating a specific incident with an item higher up in the hierarchy. For example, in talking freely about devaluating remarks by the husband, the patient related various incidents without any anxiety until she remembered a certain occasion in which

he made a number of devaluating remarks in connection with a financial matter. This transferred the verbalization from the fourth to the eleventh item of the hierarchy. These sudden shifts were, however, not always a disadvantage. On rare occasions they enabled her to move ahead without anxiety, thus saving time in desensitizing items that were vicariously covered during the free expression of scenes. At any rate, the patient avoided overanxiety by abruptly stopping talking; and it was encouraging to note that, in general, the anxiety developed during periods of free expression of scenes was easily inhibited by referring the patient to the originally desensitized "mother item" before repeating the noxious stimuli.

The interview was always concluded by encouraging remarks and gratifying imagined and verbalized scenes. The next session would begin at a point already covered without anxiety and the patient was asked to repeat material verbalized in the previous session before covering new ground. Twenty-one 1½-hour sessions of systematic desensitization were completed.

D. RESULTS

Although the treatment was condensed in a short time, one month, the outcome was dramatic. The improvement in the patient's general condition was evident, as early as the sixth session of treatment. This could be inferred from her improved sleeping and eating patterns, her verbal reports, and from other clinical observations made by the senior psychotherapist and the author.

The successful completion of the first hierarchy not only brought about an obvious change in her behavior, but it also greatly reduced the time needed to complete the other two. After the fifteenth session, the patient reported that she had overcome her phobic and hypochondriacal reactions and, for the first time since the onset of her illness, expressed an overwhelming desire to see her children and go back to them. She started taking more interest in herself and in other patients. After the eighteenth session she began to help in carrying out voluntary jobs concerning the welfare of other patients. Some of this work verified her report of getting over her phobic reactions.

She was allowed to leave hospital after the twenty-first session without performing the previously planned practical retraining in assertive behavior which she thought was unnecessary. It was evident that she had lost all her major symptoms with the exception of the mouth tic, which became less frequent, and was ready to take a more active role in running her life.

It is the belief of the chief psychotherapist, the author, and definitely that of the patient that the alleviation of her more serious symptoms was due to the short course of treatment with behavior therapy. To date, the author has

not received information concerning any relapse or substitution of new symptoms.

E. DISCUSSION

In the light of the problems mentioned in the introduction, this proposed technique may be of help in the following cases:

1. It may be more useful than Wolpe's method with some patients who feel desensitization at the imaginary level to be rather artificial. The patient, by hearing his own voice and taking a more active role in therapy, may find the process more realistic and hence be more motivated to participate. At a theoretical level, it is suggested that by shifting the main responsibility of emitting verbal behavior from the therapist to the patient, the technique of desensitization has been given a more "operant" orientation. The patient emits verbal behavior, an operant that has previously been noxious, and is reinforced by lack of anxiety. When successive reinforcements follow along the graded hierarchy, the patient's behavior is shaped by successive approximations to the highest item in the hierarchy.

2. The fact that the patient (under guidance from the therapist) does most of the talking may put him in a better position to avoid anxiety or anticipated anxiety—simply by stopping to emit this operant. This procedure may be faster and more effective than informing or signalling the therapist to stop presenting the anxiety-eliciting stimuli. The advantages of this method can be seen more clearly in the light of previously quoted research, which questions the reporting of patients concerning their experiencing of anxiety. It is suggested in this paper that a main reason for refusing to report anxiety when it is actually there, or reporting its presence when absent, is an effort on the part of the patient to acquiesce to a hierarchy of stimuli to which he has already committed himself. This new technique may give the patient a better chance to avoid much anxiety, even to stimuli he previously considered less anxiety provoking, and to pass more quickly over stimuli he finds less noxious than he anticipated.

3. Because each noxious stimulus in the hierarchy is presented in a variety of similar situations, and because of the flexibility suggested in carrying out such an activity, this technique may offer the patient actual training in generalization which may provide him with better chances of transfer from therapeutic interviews to real life situations. This may be more useful in the desensitization of neurotic behavior evoked by complex stimuli. It may also be of particular help to patients suffering from pervasive anxiety who seem to benefit very little from Wolpe's systematic desensitization technique (1,

p. 691; 5, p. 171). If this is due to the difficulty of isolating the conditioned stimuli for anxiety in a neat hierarchy, as suggested by Lang (3, p. 51), then the flexibility offered by our new technique may give the patient a better chance to desensitize his "free floating" anxiety by engaging in the free expression of imagined scenes.

4. Another possible advantage of this technique concerns the length of time the patient takes in imagining certain items. The therapist using the normal desensitization technique may be too slow or too fast in asking the patient to imagine a certain scene or perform a certain action. If this is left to the patient, who verbalizes such scenes under the guidance of the therapist, the problem of individual differences between patients and therapists may be more effectively controlled. At least, by asking the patient to imagine and verbalize, the therapist can be more certain that he is actually going over the relevant scenes.

An obvious limitation of the method here described is that it requires more skill on the part of the therapist in guiding the verbal behavior of the patient. The unchecked free expression of imagined scenes may expose the patient to undue anxiety if he talks about scenes higher up in the hierarchy. Alternately, he may dwell unnecessarily over nonanxiety-eliciting scenes, thus wasting his and the therapist's time. Another limitation concerns the ability to imagine. Some patients may find they can imagine a scene more vividly when they hear the therapist describing it. These will be at a disadvantage if they are told to verbalize themselves. However, a combination of both methods may be more fruitful: i.e., the therapist describes a scene and instructs the patient to imagine it for some time, then he asks him to verbalize it.

F. SUMMARY

This paper describes a modification of Wolpe's treatment of neurotic behavior by imaginative systematic desensitization. The modification consists of shifting the main responsibility of emitting verbal behavior from the therapist to the patient. To achieve this, a more flexible approach to systematic desensitization was suggested, and the technique applied to a case of pervasive anxiety, phobic reactions, and reactive depression.

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EFFECTS OF MEPROBAMATE ON MOODS, EMOTIONS, AND MOTIVATIONS*¹

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A. INTRODUCTION

The authors' justification for publication of yet another paper on meprobamate is that this one appears to be unique for a number of reasons: (a) use of a large number (234) of determinations on trained subjects; (b) use of three control treatments with the same Ss—placebo, dramamine (a sedative), and amphetamine (a stimulant)—thus making it possible to assert that the Ss responded as expected to each control treatment and should, therefore, respond "correctly" to meprobamate; (c) seven replications of the meprobamate treatment over a period of seven years; and (d) clear-cut results which are in directions to be expected after meprobamate is given to normal Ss.

This paper is one in a series describing the results of studies done in a period of 13 years, using essentially identical methods to study methodological problems of drug research and the actions of certain medications. The procedures were designed to make an assessment of drug-induced changes in a wide variety of moods, emotions, and motivations, and to make this assessment in such a way that the "placebo effect" was eliminated and a high degree of sensitivity achieved. Each experiment evaluated a number of drugs and placebo. Preceding papers have described methods (4), the effects of placebo and of dramamine (5), the effects of benzquinamide (1), and the effects of amphetamines (2).

The present paper describes the effects of meprobamate on moods, emotions, and motivations of male and of female college students who were 21 years

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¹ This paper is number X of a series, "Chemical studies of behavior." The studies of meprobamate here reported, conducted in the period of 1958-1965, were supported by a number of agencies in addition to the University of Rochester: Wallace Laboratories, Chas. Pfizer & Company, Bristol-Myers Company, Smith Kline & French Laboratories, Menley and James Laboratories, Warner-Lambert Research Institute, National Institute of Mental Health (Grant No. MH-4681), and Office of the Surgeon General of the Army (Contract No. DA-49-193-MD-24). Eugene Sachs, Jean S. Cameron, and G. R. Wendt conducted the 1958 experiment. Otherwise the work was done by the present authors.

or older. The total number of subjects was 144. There were 234 determinations of meprobamate which are compared with 318 placebo determinations on the same subjects (some Ss received more than one administration of meprobamate and placebo).

The data presented are from the long, free-choice form of the authors' Adjective Check List, ACL (4, p. 205) and from their short, forced-choice ACL (4, p. 207). The free-choice ACL gives the subject an opportunity to indicate which of a list of 133 self-descriptive adjectives apply to his feelings at that time (e.g., cooperative, cheerful, decisive, impulsive, active, easygoing, sleepy, belligerent, impatient, apprehensive, disturbed, confused, depressed, withdrawn). The forced-choice ACL contains 32 pairs of such items, and other questions (see below, p. 212). A brief evaluation of the free-choice ACL has been given (5, pp. 276-277). In part, the authors' presentation of data will be comparable to that used in their earlier paper on dramamine and placebo (5). The authors will not repeat the matters discussed there, except as required for comparison or clarification.

B. PROCEDURES

In each of four experiments college-student Ss, 21 years or older, served for a number of sessions, these sessions being separated by two or more days. On each day the S came twice: once in the late morning, when he filled out report forms, completed a free-choice ACL, and took his medication; and again, two hours after medication, to report on the two "out-patient" hours and to complete a free-choice ACL and a forced-choice ACL. The method was modified double-blind (4, p. 197). A number of drugs and placebo were included in each study, different Ss being assigned to different drug sequences so as to counterbalance possible variable factors. Ss came to the laboratory individually. In each experiment there was a minimum of two initial placebo sessions whose data were not used and which are not counted in the numbers of sessions listed below. [Details appear in earlier papers (2, 4).] All Ss completed all scheduled sessions. The four studies yielded 234 determinations after meprobamate and 318 after placebo. Table 1 summarizes the variables in each experiment.

C. RESULTS

1. *Results from the Short, Forced-Choice ACL*

a. Introduction. The short, forced-choice ACL (4) was first used with college-student Ss in 1958. It has been modified slightly and in its latest form consists of 32 pairs of adjectives arranged in alphabetical order: i.e.,

TABLE 1
LISTING OF THE VARIABLES FOR THE FOUR EXPERIMENTS

Inclusive dates of each experiment	N	Sex	I	II	III	IV	V	VI	VII	VIII	IX
1958, Feb. 28—April 29	30	M	11	3	4	600, 800 mg	1	80	1	1	1
1959, March 23—May 28	36	M	13	2	1	600 mg	2	80	1	1	6
1964, Oct. 5—Feb. 5, 1965	39	M	14	2	1	400 mg	1	80	1	1	8
1965, Feb. 2—May 10	39	F	16	2	1	400 mg	2	50	2	1	8
Total	144		54	9	7		6		5	4	23

Note: Column I = Total number of sessions, Column II = Number of placebo sessions, Column III = Number of meprobamate sessions, Column IV = Amount of meprobamate, Column V = Number of dramamine, Column VI = Amount of dramamine, Column VII = Number of amphetamine, Column VIII = Tranquilizer + amphetamine, and Column IX = Number of other drug sessions.

active—energetic, angry—annoyed, anxious—fearful, etc. It is administered in each posttreatment session. The *S* is required to make a judgment for each pair of adjectives of “. . . whether you felt more that way before the drug took effect or whether you feel more that way now.” This is done by circling either the word “before” or the word “now” adjacent to the adjective pair. In addition, *Ss* answer three other questions:

Which way of feeling did you like better? Before Now

Do you believe that you felt any drug effects today?

None_____ Slight_____ Moderate_____ Strong_____

Completing this list today was:

Difficult_____ Moderately difficult_____

Moderately easy_____ Easy_____

Except for the last two items, the data yielded by this ACL consist of frequencies of choice, for each item, of “before” or of “now.” They therefore yield a quantitative statement of the proportion of *Ss* who made each choice after each treatment condition.

b. Meprobamate and placebo results on the forced-choice ACL. In the authors' present display of results they have arranged the total of 37 items (from two forms) of the ACL in rank order from that item which gave the highest frequency of *Ss* checking “now” after meprobamate (drowsy—sleepy) to that which gave the lowest frequency (industrious—work-oriented). Table 2 shows the list of items on the left, the percentages of *Ss* choosing “now” after meprobamate in the first column of figures, the percentages choosing “now” after placebo in the last column, and the differences between meprobamate and placebo in the center. (Values of “student's” *t* are shown in parentheses.) The same *Ss* are involved for both treatments but, because in some experiments more than one placebo treatment was available, the total *N* differs for placebo and meprobamate.

The column of placebo data shows, for rather large numbers of determinations, how *Ss* judged themselves as feeling after lunch as compared to before lunch. The ideal outcome of placebo data is that no influence of the administration of capsules (and no influence of the time of day) take place—i.e., random changes. Inspection of the 37 items confirms that the data are free from placebo effects other than the influence of lunch and two hours of time in the middle of the day. All items are included within the range, 50 per cent \pm 8 per cent. Twenty-six fall between 45 per cent and 55 per cent. The remaining 11 indicate a slight shift toward a relaxed positive mood (e.g., easygoing—relaxed, 56 per cent; genial—friendly, 57 per cent; decisive—capable, 58 per cent) and away from the negative emotions (e.g., angry—an-

TABLE 2
FORCED-CHOICE ADJECTIVE CHECK LIST: DATA ON MEPROBAMATE ($N = 234$)
COMPARED WITH PLACEBO ($N = 318$)

Adjective pair	% "nows" after meprobamate	% meprobamate-placebo difference		% "nows" after placebo
1. drowsy—sleepy	68	+19	+4.59	49
2. dull—sluggish	65	+16	+3.82	49
3. tired—washed-out	65	+15	+3.58	50
4. weak—lacking strength ^a	65	+15	+2.74	50
5. easygoing—relaxed	62	+6		56
6. bored—uninterested	59	+14	+3.29	45
7. quiet—peaceful	59	+3		56
8. intoxicated—light-headed	58	+9	+2.11	49
9. sympathetic—considerate ^b	54	-1		55
10. confused—disorganized	53	+11	+2.57	42
11. optimistic—high-spirited ^b	53	0		53
12. gloomy—blue	52	+5		47
13. cheerful—happy	51	-3		54
14. genial—friendly	51	-6		57
15. downhearted—sad	50	+5		45
16. reckless—uninhibited ^b	49	0		49
17. angry—annoyed	48	+3		43
18. impatient—snappish	48	+3		45
19. pain—discomfort	48	+1		47
20. decisive—capable	47	-11	-2.57	58
21. disturbed—upset	46	+2		44
22. grouchy—irritable	46	+1		45
23. guilty—remorseful ^a	46	+1		45
24. resentful—indignant	46	+2		44
25. self-confident—courageous	46	-7		53
26. defiant—belligerent ^a	45	-3		48
27. humorous—witty	45	-4		49
28. self-conscious—timid	45	+3		42
29. which way felt better	45	-7		52
30. anxious—fearful	44	+2		42
31. active—energetic	42	-13	-3.05	55
32. effective—efficient	42	-13	-3.05	55
33. jittery—nervous	42	-4		46
34. talkative—chatty	42	-5		47
35. careful—meticulous ^a	40	-9		49
36. egotistic—boastful	39	-10	-2.36	49
37. industrious—work-oriented	39	-18	-4.27	57

^a These items were not used in 1964-1966. Hence, for meprobamate, $N = 156$; for placebo, $N = 162$.

^b These items were added in 1963. Hence, for meprobamate, $N = 78$; for placebo, $N = 156$.

noyed, 43 per cent; anxious—fearful, 42 per cent). This result is similar to that obtained in the authors' whole series of experiments (2, pp. 102-104).

The meprobamate data range from 68 per cent to 39 per cent and show an increase in negative mood states and a decrease in positive mood states. It is

obvious that a "tranquilizing" substance affects healthy 21-year-olds not only by yielding substantial increases in drowsy—sleepy, dull—sluggish, tired—washed-out, etc., but also by lowering the frequencies of such items as industrious—work-oriented, effective—efficient, active—energetic, decisive—capable, and egotistic—boastful. Some readers may wish to note that most of the smaller (not statistically significant) differences are in the expected directions.

2. Results from the Long, Free-Choice ACL

a. Introduction. The free-choice ACL consists of 133 adjectives alphabetically listed—i.e., active, affectionate, agreeable, ambitious, etc.—in vertical columns. The *S* checks or double checks each adjective that describes his feelings at that time. The free-choice ACL is completed twice by the *S*, once before and once two hours after drug, yielding a *change score* for each of the adjectives which can then be totalled for the group of *Ss*.

b. Change scores of each adjective after meprobamate (all Ss). Table 3 lists for all samples of *Ss* the total changes in number of check marks from before meprobamate to after meprobamate for each of 133 adjectives. The list is in rank order from that adjective which increased most to that which decreased most.

Those adjectives which showed increased check marks after meprobamate form a consistent pattern of relaxed sleepiness until one gets to rather low numbers. Adjectives that showed decreased check marks reflect the lowering of activity with a concomitant lessening of cheerfulness and enthusiasm.

The placebo data are similar to what the authors have reported elsewhere (5, pp. 269-274; 2, pp. 115-117). The only consistent pattern other than random changes is that of postlunch relaxation with a small increase in check marks for such adjectives as drifting, lackadaisical, leisurely, and a decrease in check marks for ambitious, confident, optimistic.

c. Total change scores for a priori clusters. Twelve groups of adjectives have been selected from the long ACL to represent meaningful emotional and motivational states (2, p. 108). (Needless to say, it is an easier task to compare 12 cluster scores for two conditions than to take on the formidable chore of comparing 133 change scores.) Table 4 presents key adjectives for each cluster, the number of such adjectives in each, and the total change score per cluster for both meprobamate and placebo. The totals for 318 placebo determinations have been adjusted proportionately to an *N* of 234 to match the number of meprobamate determinations. The 12 clusters have been arranged

in rank order from that which increased most to that which decreased most for meprobamate.

The statistical reliabilities of the differences between meprobamate and placebo shown in Table 4 have not been computed because the authors did

TABLE 3
FREE-CHOICE ADJECTIVE CHECK LIST: RANK ORDER FOR 133 ADJECTIVE CHANGE SCORES
(Four studies of meprobamate, $N = 234$)

+77 sleepy	+ 6 affectionate	- 4 angry	-18 genial
+74 drowsy	calm	disturbed	-19 cooperative
+71 sluggish	close-mouthed	dominating	masterful
+52 lazy	hostile	jittery	-20 assertive
+51 tired	intoxicated	nervous	efficient
+45 relaxed	sad	- 5 cautious	engrossed
+43 dull	+ 5 carefree	suspicious	forceful
+42 lackadaisical	+ 4 belligerent	- 6 elated	good-natured
languid	blue	impulsive	-21 uneasy
+35 washed-out	dubious	mischievous	-23 decisive
+34 weary	+ 3 irritable	skeptical	friendly
+33 contented	stomach-ache	unhappy	-24 work-oriented
+32 subdued	+ 2 brooding	- 7 creative	-26 optimistic
+30 headache	self-contained	obliging	-27 active
+27 leisurely	shy	- 8 keyed-up	-28 effective
weak	+ 1 doubtful	- 9 dissatisfied	-29 business-like
+24 apathetic	fearless	kindly	happy
detached	joyous	lonely	-30 attentive
+22 drifting	willful	-10 apprehensive	industrious
indifferent	witty	boastful	-31 enterprising
+20 light-headed	0 emotional	egotistic	enthusiastic
+18 peaceful	uninhibited	-11 self-conscious	-33 agreeable
+16 dizzy	upset	-12 impatient	energetic
+15 silent	- 1 downhearted	worried	self-confident
+14 confused	reckless	-13 humorous	task-involved
+13 remorseful	- 2 careful	-14 excited	vigorous
tame	guilty	satisfied	-38 cheerful
withdrawn	patient	-15 amused	-42 eager
+12 changeable	trustful	resourceful	-44 hard-working
+11 bored	warm-hearted	-17 confident	-49 ambitious
+10 dreamy	- 3 defiant	generous	
nonchalant	easygoing	sarcastic	
quiet	nauseated	social	
+ 9 annoyed	rebellious	talkative	
+ 7 depressed			

not have a sufficient budget to do the scoring and make the computations. (There are 146,832 item responses to be scored and processed.) However, computations of similar data for the effects of amphetamines on the same cluster scores (2, p. 109, Table 6), and comparison of the bar diagram in Figure 1 with similar bar diagrams of the effects of amphetamines suggest that the placebo-meprobamate differences between such clusters as 1, drowsy, and 12, active, are reliable at better than the .001 level and that the least

proportional differences (2, calm; 3, apathetic; 6, angry; and 7, apprehensive) may be reliable at the .05 level or better.

3. Subjective Awareness of Drug Effects

Beginning in 1959, the forced-choice ACL included the question, "Do you feel any drug effects today?" Ss could select one of the following: None, Slight, Moderate, Strong. The percentage of Ss reporting effects after meprobamate

TABLE 4
FREE-CHOICE ADJECTIVE CHECK LIST: TOTAL CHANGE SCORES IN *a Priori* CLUSTERS
AFTER MEPROBAMATE AND PLACEBO

Type of adjective and number of adjectives in cluster	Meprobamate (<i>N</i> = 234)	Placebo (<i>N</i> = 318) adjusted to <i>N</i> = 234)
1. Drowsy, lazy, sleepy, sluggish (8)	+421	— 9
2. Calm, dreamy, drifting, relaxed (14)	+253	+142
3. Apathetic, bored, indifferent, withdrawn (11)	+153	+ 68
4. Light-headed, dizzy, headache (6)	+ 72	+ 19
5. Blue, depressed, guilty, unhappy (9)	+ 66	— 30
6. Angry, belligerent, defiant, sarcastic (9)	— 17	— 47
7. Apprehensive, careful, self-conscious (9)	— 32	— 58
8. Disturbed, nervous, uneasy, upset (11)	— 36	—107
9. Assertive, decisive, egotistic, boastful (12)	—175	— 70
10. Friendly, good-natured, trustful, warm-hearted (17)	—196	— 47
11. Elated, enthusiastic, self-confident, uninhibited (14)	—232	—108
12. Active, ambitious, energetic, industrious (13)	—409	— 50

(*N* = 114) was 54 per cent; after placebo (*N* = 228), 42 per cent. The difference of 12 per cent yields a $t = 2.11$, $p = .05$.

4. Inspection of Results for Dose-Response Differences

With the meprobamate dose ranging from 400 mg to 800 mg, the authors were interested in determining whether the data from either the forced-choice ACL or the free-choice ACL reflected a dose-dependent response. (The sample size is not ideal for such comparisons in that the 800 mg dose had only 30 determinations, compared to 126 for the 600 mg and 78 for the 400 mg.)

Inasmuch as the forced-choice ACL is the more sensitive of the two instruments (2, p. 102 and 106), it is not surprising that inspection of the items by dose yields a cohesive group of adjective pairs with a linear or near linear relationship from 800 mg to 600 mg to 400 mg. The higher the dose, the higher the frequency of "now" responses for the following: downhearted—sad, drowsy—sleepy, dull—sluggish, gloomy—blue, and tired—washed-out. Also, the higher the dose, the lower the frequency of "now" responses for

these items: active—energetic, decisive—capable, industrious—work-oriented, and self-confident—courageous.

Similar inspection of the long free-choice ACL is not as fruitful. There is no substantial number of individual adjectives out of the 133 which show change scores relative to dose size. Analysis of the 12 *a priori* cluster scores for each dose shows that the three dose levels have much more in common

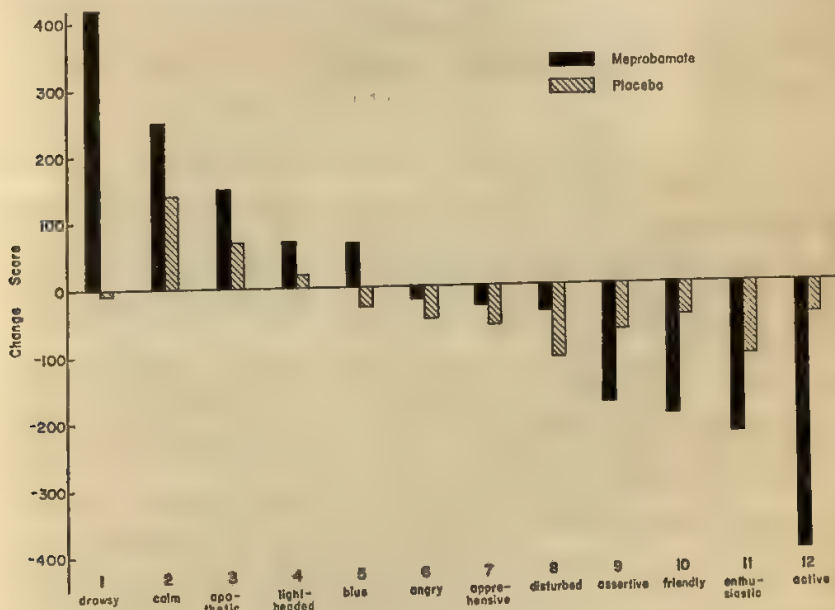


FIGURE 1
TOTAL CHANGE SCORES IN *a Priori* CLUSTERS AFTER MEPROBAMATE
($N = 234$) AND PLACEBO ($N = 318$ ADJUSTED TO $N = 234$)

than any one of them has with placebo. An example of this would be the scores for each dose, 800 mg, 600 mg, 400 mg, and placebo for the drowsy cluster; +161, +141, +131, and -3, respectively (computed with N adjusted to 78 for the four treatments).

D. DISCUSSION

The authors feel that most of the preceding presentation of results requires no discussion, since the inferences from the data are self-evident: that meprobamate is an active drug and that it affects various emotional and motivational states in normal S s in the directions to be expected from a tranquilizer.

The reader is reminded that each experimental group responded typically to dramamine, amphetamine, and placebo, hence leading to the strong logical inference that their response to meprobamate was "correct."

The authors wish to comment briefly on only four problems: (a) the state of the research literature on the effects of meprobamate on normal Ss; (b) the advantages and weaknesses of using normal human subjects for research on the emotional and motivational effects of tranquilizers; (c) the essential features of the authors' procedures that account for replicability of results, for sensitivity of method, and for absence of placebo effects; and (d) a comparison of the effects of meprobamate with those of other drugs.

1. *Research Literature on Effects of Meprobamate*

It had been the authors' original, naive intention to include a brief account of the findings of experiments relevant to theirs. Many sad hours spent with the literature leave them frustrated for lack of an objective approach to evaluation. Each of the following list of faults was committed by high prestige investigators publishing in high prestige media.

1. Use of too few Ss (as few as six or eight), extremely heterogeneous Ss, and failure to specify the nature of Ss. When using a relatively weak drug, such as meprobamate, such papers should be withheld from publication until substantial replication is achieved.
2. Failure to specify in adequate detail how an experiment was conducted.
3. Failure to use "blind" procedures for the Ss: e.g., use of different colored capsules for different treatments; using no appropriate randomization of treatments so that the effects of Ss' intercommunications are thereby counterbalanced.
4. Use of competitive conditions in performance tests. It has been known for more than a half-century that the effects of weak sedatives can be overcome by motivation (3), except under a few special conditions, such as extreme difficulty of task.
5. Use of test periods too early for the drug to have taken effect, use of doses too small to be detectable, use of doses so large as to be irrelevant to the problem.
6. Use of assembly-line testing by "technicians" who may be presumed to increase variability of response because of variability of motivation.
7. Use of so many test variables lacking *a priori* relevance to the presumed action of the drug that statistical tests almost necessarily indicate that the drug is without probable effect.

8. Willingness to publish improbable results without the test of replication and without an attempt to account for them.

The authors have regretfully concluded that it is preferable for them to present only their own data, leaving literature reviews for others to attempt.

2. *Advantages and Weaknesses of Using Normal Human Ss*

The normal, healthy, intelligent 21-year-old college senior responds to meprobamate, but the response is different from that of the person who needs the drug to control anxiety. The latter likes the drug, the former usually does not. The college senior normally comes to the laboratory with relatively few unpleasant emotional states; it is, therefore, more difficult to make him feel better by use of a drug than to make him feel worse. He interprets sedation as an undesirable state (5), whereas the patient seeks it. But, if we make allowance for the difference in emotional needs, the data from the normal subject can have certain unique values in psychopharmacology.

The attitudes and performance of normal Ss are more controllable and predictable than those of patients. The normal S has fewer emotional axes to grind and hence can be almost totally divested of placebo effects. His motivation can be kept at a satisfactory level, resulting in sensitive and valid responses to the drugs, and in replicability of data.

The authors feel that well-conducted experiments using normal Ss can be an anchor point or reference point for studies with clinical groups. They cannot usually be a substitute—e.g., we would not be able to test the relief of headaches in a group without headaches—but it can indicate whether a drug is weakly or strongly active and something about the nature of its action. For many drugs—e.g., amphetamines—the results obtained from college senior Ss would be generalizable to most other groups.

3. *Essential Features of the Authors' Procedures*

Adjective check lists have been adopted for drug evaluation by a number of investigators. Some have been unable to duplicate the sensitivity and replicability of the authors' experiments. The authors suspect that this is because they have been convinced that the essential features of the method lay in the "instruments" (the ACLs) and in the experimental design. The authors disagree. While instruments and experimental design are important, it is essential that other aspects of the procedures also be replicated: the initial indoctrination of the Ss, the physical layout of the laboratory, the impact of the personnel, the opportunity for some training of Ss, the control of the Ss' expectations so that sedation and stimulation are equally expected and absence of effects and

weak effects are expected in a preponderance of sessions, and, above all, the development of Ss' attitudes of respect and approval resulting from treating every subject as an individual who is known and whose attitudes and feelings are acknowledged and respected.

4. *Effects of Barbiturates and of Another Tranquilizer*

The authors have been working on moods, emotions, and motivations as affected by drug action since 1950 and wish to comment (without documentation) on the effects of other substances. These experiments were done on normal humans, aged 21 and over, and the treatment evaluated while the Ss were socially active.

Three common barbiturates—secobarbital, amobarbital, and pentobarbital—have in common their ability to cause a feeling of relaxation. In many other respects they differ radically. As in the case of alcohol, there is often little similarity of effect between day-time use and the normal bed-time use of sedatives. The effect of Seconal on emotions and motivations of the active subject is most prominent on self-confidence. A 30-50 mg dose enhances self-confidence; doses of 100-200 mg cause recklessness and aggressiveness. Amytal's most significant action is on depression of anxiety. At low doses the social effects may be desirable; at high doses the suppression of anxiety may release hostile acts toward others. Nembutal at low doses produces a social non-chalance; at high doses it produces silliness.

The effects of Dramamine (dimenhydrinate) on the active subject are superficially very like those here described for meprobamate, except that they are emotionally probably less pleasant. The effects of this drug are more dose-dependent than seems to be true of meprobamate.

Although the ACL (and other means of evaluation of drugs in active subjects) shows similarities between meprobamate, dimenhydrinate, and secobarbital, they behave differently when they are combined with amphetamines. Meprobamate plus amphetamine yields an effect quantitatively and qualitatively like amphetamine alone, except that it is substantially more relaxed and socially more desirable. Secobarbital plus amphetamine tends to emphasize the socially least desirable features of each component (self-confidence or recklessness, impulse to get socially involved with people while being cheerfully aggressive, and talkativeness). Dimenhydrinate plus amphetamine appears to result in cancellation of the mood effects of each.

E. SUMMARY

1. In four experiments conducted over a period of seven years on 144 normal male and female college-student Ss, 21 years or older, the authors

made 234 determinations of the effects of meprobamate on moods, emotions, and motivations as determined by free-choice adjective check lists and forced-choice ACLs. These were compared to 318 determinations after placebo in the same Ss.

2. These normal subjects, given doses of 400, 600, or 800 mg, showed sedation effects with a statistical significance often better than $p = .001$. They became more drowsy, washed-out, bored, and blue than after placebo, as well as less active, friendly, and industrious.

3. It is concluded that meprobamate is an active drug and that normal Ss yield valuable information about its effects.

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A STUDY OF SCALED DIMENSIONS OF TEACHER BEHAVIOR AS PERCEIVED BY STUDENTS*

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A. INTRODUCTION

Applying a measure of bipolar adjectives, commonly called the semantic differential (SD), to a particular concept, Osgood (4, 5) reported that more than 50 per cent of the variance of scaled responses may be attributed to three general factors: evaluation, activity, and potency. At least three dimensions of connotative meaning, therefore, seem to be obtained from the factor analysis of the scaled data on adjective pairs. When the concepts relate to people, however, it is common for the last two factors to coalesce into a single factor, labelled "dynamism" (2, 6).

The Pupil Observation Survey (POS) is a 38-item questionnaire developed by Veldman and Peck (7, 8) to elicit reactions of students concerning perceived teacher behavior. In their study, five common factors resulted from a factor analysis of mean response to the items by junior and senior high school students evaluating the behavior of 554 student teachers. White and Dekle (9), using individual student responses to POS items with elementary school pupils, found perception of teacher behavior to differ as a function of student achievement level. The need for social approval was also found to be a meaningful variable in assessing teacher behavior with the POS in the college classroom (10).

The concept of teacher behavior is measurable by the SD and the POS when considered from the standpoint of the individual responses of the students. Prior research on the SD suggests two major dimensions of the concept of teacher behavior. Research with the POS suggests five dimensions of teacher behavior. There are basic differences in the SD and POS, however, particularly with regard to content and presentation of items, and the purpose of the present study is to compare the structure of the domain of teacher behavior as measured by the SD and POS scales.

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TABLE 1
ITEMS OF THE POS AND SD SCALES

Item number	Item
POS	
1.	She is admired by most of her students
2.	She has made her subject alive and interesting for me
3.	She expects a lot from her students and usually gets it
4.	She explains her assignments clearly and completely
5.	She hardly ever gets flustered about anything that happens
6.	She seems to understand the problems students have
7.	She is never stumped by a student's question
8.	Before she decides on a new project, she often asks the students what they think
9.	She usually looks on the bright side of things
10.	She is the best teacher I have ever had
11.	I would like to be like her in some ways
12.	Her class is never dull or boring
13.	You can depend on her to be fair with you
14.	She doesn't let the class discussion get too far off the subject
15.	She always seems sure of herself in front of the class
16.	You can tell that she really likes her students
17.	She knows a great deal about her subject
18.	She never seems to order her students around
19.	She smiles most of the time
20.	I wish all my teachers were like her
21.	She sets a good example for her students
22.	She knows how to put her subject across in a lively way
23.	Students respect her because she means what she says
24.	She doesn't try to cover the lesson too fast
25.	She doesn't seem to be afraid of making mistakes
26.	She is always friendly toward her students
27.	She must have studied hard to know so much about her subject
28.	She likes to give the students a choice of how to do an assignment
29.	She always seems cheerful and happy
30.	I would like to have her as a personal friend
31.	She makes learning seem more like fun than work
32.	She doesn't let her students get away with anything
33.	She always seems to know just what she'll do next
34.	She doesn't get confused by unexpected questions
35.	She is as interested in her students as she is in her subject
36.	She seems to know more about her subject than just what is in the book
37.	She is always interested in hearing a student's ideas
38.	She is good-natured and easy to get along with

B. METHOD

1. *Subjects*

The sample included 197 students (115 males and 82 females) from six English classes in a secondary school. Students were informed that their responses would be anonymous and that the purpose of the investigation was to study "... several ways of preparing college students to be teachers. The

TABLE 1 (*continued*)

Item number	Item
SD	
1.	Good-Bad
2.	Pleasant-Unpleasant
3.	Happy-Sad
4.	Fair-Unfair
5.	Fast-Slow
6.	Active-Passive
7.	Hot-Cold
8.	Sharp-Dull
9.	Large-Small
10.	Strong-Weak
11.	Heavy-Light
12.	Thick-Thin

University wants to know how you feel about working with your teacher in this English class." The six female English teachers, then, were the stimulus figures for the student appraisal.

2. Procedure

The 197 students rated their teachers on each of the 38 POS items and on each of the 12 SD adjective pairs, which are listed and numbered in Table 1. The POS items were scored 4 for *T* (always or completely true), 3 for *t* (more often true than false), 2 for *f* (more often false than true), and 1 for *F* (always or completely false). On each of the 12 SD items, the students rated their teachers as being more like one adjective or the other on a seven-point scale, one to seven from left to right, as the adjective pairs are shown in Table 1.

Three factor analyses were conducted with the student ratings of teachers. The 38 POS items were intercorrelated by the product-moment method and factor analyzed by the principal component method with unities in the principal diagonal; 10 components, with eigenvalues greater than one and accounting for approximately 62 per cent of the total variance in the system, were rotated by Kaiser's (3) normalized varimax routine. A similar analysis was conducted with responses to the 12 SD items, the rotation including four components which accounted for 61 per cent of the total variance. All 50 items were then subjected to the same analysis with 15 factors, representing 65 per cent of the total variance, in the rotation process. The rotated factor loadings greater than .30 were used in the interpretation of factors.

C. RESULTS

The results of the Veldman-Peck study suggest five common factors in the rating of teacher characteristics with the POS. The factor analysis of the POS items in the present study resulted in 10 factors as shown in Table 2. The first factor, Democratic Leadership, has 15 variables with loadings above .30 and is characterized by items, such as "17. She knows a great deal about her subject," and "18. She never seems to order students around." Apparently, teachers with high scores on this factor would be seen by students to be democratic rather than dictatorial, knowledgeable and clear in presentations, and pleasant. The second factor, Lively and Interesting, is a strong factor with 13 items. The thirty-eighth item, however—"She is good-natured and easy to get along with"—has a high negative loading on Factor II. The next five factors are determined by five to seven items each and are as follows: Factor III—Friendly, Cheerful, and Admired; Factor IV—Knowledgeable; Factor V—Instructional; Factor VI—Stimulating but Rigid; and Factor VII—Impartial Control. Of these five factors, Factors IV, V, and VI all have bipolar characteristics with both positive and negative loadings. Factor VIII (Amiable Control) is a triplet, while Factor IX (Student Centered Instruction) and Factor X (Demanding) are both doublets. Factor X, in fact, is hardly a common factor at all, but rather specific to item three, "She expects a lot from her students and usually gets it." In summary, then, the 38 POS items have a basic structure of nine common factors.

From previous research [e.g., Osgood, Suci, and Tannenbaum (6)], it was expected that the correlational structure of the 12 SD items would collapse into no more than three common factors: the first four items would determine an Evaluative Factor, the next four items would determine an Activity Factor, and the last four items would determine a Potency Factor. As can be seen in Table 3, the result was as expected with the exception of the last item in each group. Item 4 loaded heavily on the Activity Factor, item 8 loaded heavily on the Potency Factor, and item 12 was not even in the common factor space but rather formed a specific factor alone. Such systematic, unexpected results are almost worthy of an hypothesis regarding experimental methodology, but the methodology did not differ from that used in previous studies and the hypothesis is supported for the most part.

The major results of the factor analysis of the combined 38 POS and 12 SD items are presented in Table 4. Generally, the basic structure of the SD items maintained stability in the larger analysis. Factor I is the SD Evaluative Factor together with a part of the POS Lively-and-Interesting and Demand-

TABLE 2
ROTATED FACTORS OF THE POS ITEMS FOR 197 SECONDARY SCHOOL STUDENTS

Item	Factor										h ²
	I	II	III	IV	V	VI	VII	VIII	IX	X	
1.		.73									.64
2.								.72			.61
3.										.78	.69
4.	.45				.41					.31	.52
5.	.56										.55
6.						.75					.66
7.				.50			.33	.31			.59
8.	.55										.52
9.		.62									.66
10.	.39				-.32		.38				.53
11.		.73									.60
12.	.55						.57				.70
13.				-.52					.42		.66
14.			.55		.38				.35		.65
15.	.67										.68
16.			.75								.63
17.	.75										.64
18.	.68										.73
19.	.57	.53					.38				.63
20.	.50								.39		.58
21.		.64									.53
22.							.62				.57
23.					.52		.42				.69
24.				.50	.33				.37		.62
25.	.57							-.38			.52
26.			.54				.39				.74
27.				.77							.69
28.	.60							-.33			.62
29.	.38						.57				.57
30.		.60		.34				.60			.53
31.									.69		.58
32.											.68
33.					.44	.61					.48
34.	.35						.38				.57
35.				.35			.55				.60
36.				.42			.52				.70
37.	.44						.62				.59
38.		.39					-.51				

Note: I = Democratic Leadership; II = Friendly, Cheerful, Admired; III = Amiable Control; IV = Knowledgeable; V = Instructional; VI = Student Centered Instruction; VII = Lively and Interesting; VIII = Stimulating but Rigid; IX = Impartial Control; and X = Demanding.

ing Factors. The original SD Activity Factor was split into two parts as indicated by Factors II and III in Table 4. Half of the variables for the Activity Factor are located on Factor II with the major items from the POS Impartial Control Factor variables, while the remaining Activity Factor variables are isolated on Factor III. Unlike the other SD common factors, Potency, Factor

IV, maintains its stability and independence in the larger domain. Factors V through XI in Table 4 correspond, to a large extent, to Factors I through VI and VIII, respectively, in the basic POS structure. Factors XII and XIII appear to be "new" factors in the POS. An Ideal Teacher Model would be characterized by Factor XII, while Factor XIII reflects Socratic aspects of the teacher role. Item 12 of the SD remains specific on Factor XIV and another specific factor appeared for POS item six on Factor XV.

TABLE 3
ROTATED FACTORS OF 12 SCALES OF THE SEMANTIC DIFFERENTIAL
FOR 197 SECONDARY SCHOOL STUDENTS

Adjective pairs	Rotated factors				h ²
	I: Evaluative	II: Activity	III: Potency	IV: Thick- Thin	
1. Good-Bad	.88				.75
2. Pleasant-Unpleasant	.70				.63
3. Happy-Sad	.77				.72
4. Sharp-Dull			.73		.61
5. Large-Small			.54		.69
6. Strong-Weak			.87		.70
7. Heavy-Light			.83		.60
8. Fair-Unfair		.71			.62
9. Fast-Slow		.59			.51
10. Active-Passive		.66			.80
11. Hot-Cold		.64			.73
12. Thick-Thin				.89	.71

D. DISCUSSION

The factor structure obtained from the students' responses to the 38 items of the POS in this study differs significantly from the structure of the 38 POS items determined in the analysis reported by Veldman and Peck (7). Here, 10 factors were obtained from the rotated factor matrix, in comparison to the five factors of the Veldman-Peck investigation. There are many reasons, of course, why the factor structures might differ. Their sample of teachers is more heterogeneous, but even more important is the fact that their factor structure is based on average ratings which fail to reflect individual variations directly in analysis. The present study involved *individual* student ratings of only six female English teachers, while Veldman and Peck studied *average* student ratings for 554 student teachers.

The Veldman-Peck paper is not a presentation of the full factor structure of the POS item but, apparently, gives only the highest loading for each item. Their presentation, while meaningful, implies a very simple structure in the POS, since no item is shown to load on more than one factor. No such completely simple structure was found in the present study.

TABLE 4
ROTATED FACTORS OF POS AND SD VARIABLES FOR THE 197 SECONDARY STUDENTS
RATING THEIR ENGLISH TEACHER

[illegible]

TABLE 4 (continued)

Variable	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	h^2
30.							.58									.59
31.		.42								.68						.63
32.								-.33								.64
33.									.74							.74
34.					.39	.32										.51
35.						.61										.65
36.	.34					.40										.62
37.	.36				.49	.49										.71
38.	-.65						-.30									.75
SD item																
1.	-.67				-.34											.75
2.	-.54		.32									.32				.72
3.	-.74															.72
4.		.69														.61
5.		.64												.31		.70
6.			.81													.73
7.		.42	.46													.70
8.				-.69					-.35							.63
9.				-.49												.60
10.				-.86					-.37							.80
11.				-.83												.73
12.														-.79		.71

Note: I = Evaluative; II = Impartial Control; III = Activity; IV = Potency; V = Democratic Leadership; VI = Lively and Interesting; VII = Friendly, Cheerful, Admired; VIII = Knowledgeable; IX = Instructional; X = Stimulating but Rigid; XI = Amiable Control; XII = Ideal Teacher Model; XIII = Socratic; XIV = Thick-Thin; and XV = Student Centered Instruction.

All of the seven items in the authors' third factor (*viz.*, Friendly, Cheerful, Admired) can be found in the Veldman-Peck first factor with the same label, but almost as many items from their first factor are loaded also on the Democratic Leadership and Lively and Interesting Factors. The Democratic Leadership Factor included the two items from the Veldman-Peck Democratic Procedure Factor as well as items from each of their first three factors; the authors' factor, therefore, reflects more leadership characteristics than merely procedural qualities of the teacher role. Items from their second and third factors (*viz.*, Knowledgeable, Poised, and Interesting, Preferred) are shown to load on six of the authors' factors, while items from their Strict Control Factor are loaded on five of the factors.

Veldman and Peck do not report why or how the 38 items were selected for the POS. The items were stated positively and this may produce an elevated mean rating as a response set, but should have little effect on the correlation structure [e.g., Anderson *et al.* (1)]. Apparently, the items were selected to represent the major effective characteristics of the teacher role. From the authors' analysis, the most important factors are the nondictatorial and intelligent aspects that are stimulating in the classroom. Teacher control is seen in terms of objective assessment as well as warm acceptance of the student. The teacher's knowledgeable, instructional, and demanding qualities are, also, all identifiable as important dimensions of effective teaching.

An interesting hypothesis that should show considerable promise for further research relates to the semantic meaning of those teacher motivations. Implications are that when the students in the sample of this study made judgments about "their teachers," their appraisals were largely classified under three general dimensions of semantic meaning: evaluation, potency, and activity. Contrary to prior research with ratings of persons [e.g., Hallworth (2), and Osgood, Suci, and Tannenbaum (6)], no evidence was found to support the coalescence of "activity" and "potency" factors into a single factor of "dynamism."

When the SD and POS items were combined in analysis, the SD Potency Factor remained independent, while the Evaluative and Activity Factors were more closely related with POS factors. Apparently, the teacher characteristics reflected by the SD Potency Factor are not reflected in factors of the POS, and this finding might well be a focus of further study. Parts of the SD Activity are associated with Impartial Control in POS, while the SD Evaluative Factor is more related to instruction and presentation of material.

E. SUMMARY

The concept of teacher behavior was measured by the individual responses of 197 secondary school students on 12 bipolar adjectives of the semantic differential (SD) and the 38 items of the Pupil Observation Survey (POS). Separate factor analyses were conducted from student ratings on the SD and POS items. Ten factors emerged from the rotated factor matrix of the POS in comparison to five factors of the Veldman and Peck (7) investigation. Three common factors were determined in the correlational structure of the 12 SD items: evaluation, potency, and activity. When a factor analysis of the combined 38 POS and SD variables was conducted, the basic structure of the SD items generally maintained stability. Relationships between the perception of teacher characteristics and semantic meaning were examined.

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A PERSONALITY/ATTITUDE SCHEDULE FOR USE IN EXPERIMENTAL BARGAINING STUDIES*¹

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A. INTRODUCTION

The role of individual personality differences (among American subjects) in experimental bargaining situations, particularly in prisoner dilemma games, has been reported in a number of studies. Using an "internationalism" scale and selecting subjects (Ss) with extreme scores, Lutzker (9) found that "internationalist" pairs made significantly more cooperative choices than did "isolationists." McClintock, Harrison, Strand, and Gallo (11) found similar results when "isolationist" and "internationalist" Ss were paired against programmed "other players" using strategies with markedly different levels of cooperative responses. Also using a programmed opponent, but in this case one that responded with an unconditionally cooperative choice, Marlowe (10) reported that extreme noncooperators scored significantly higher than extremely cooperative Ss on need aggression and autonomy on the Gough Adjective Check List; extremely cooperative Ss scored higher than noncooperators on need abasement and need deference. For a similar game, Deutsch (4) found that authoritarianism scores as measured by the *F* scale correlated significantly with game behavior. Ss with low *F* scores tended to be trusting and trustworthy, and those with high *F* scores tended to be suspicious and untrustworthy in their game choices. A review of other studies by Rapoport and Orwant (14) also suggests that behavior in nonzero-sum games is influenced by personality factors.

These general findings seemed to warrant the development of a test battery to assess the role of personality and attitude differences in bargaining behavior. The Personality/Attitude Schedule (PAS) described in this paper evolved out of an effort to find a number of existing attitude and personality scales that would prove useful in accounting for some aspects of behavior in experi-

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ments involving social interaction, particularly in bargaining and negotiation situations.

Since a variety of existing tests clearly appeared to have potential or established relevance, selection from among these proved a difficult task. In many cases, a comparison of the tests revealed less uniqueness in content than in labels. Since a number of the tests were widely employed as research instruments, it was decided that a factor analysis would be a useful first step to determine whether a meaningful common factor structure might be found to characterize the tests selected for the battery. This information not only proved useful in clarifying interpretations of the tests in the original battery, but led to the design of new test scales.

B. PROCEDURES

1. *Selection of Tests*

Twenty-four test scales were selected for their presumed or previously established relevance to bargaining behavior. The original test battery included the following scales:²

1. Adorno, Frenkel-Brunswik, Levinson, and Sanford (1)
 - a. California *F* scale (*F*)
2. Brim (2)
 - a. Extremity-Confidence Scale (*EC*)
3. Guilford, Christensen, Bond, and Sutton Human Interest Tests (6)
 - a. Material Risk (*RM*)
 - b. Physical Risk (*RP*)
4. Thurstone Temperament Schedule (17)
 - a. Stable (*S*)
 - b. Active (*A*)
5. Rotter, Seeman, and Liverant (15)
 - a. Internal/External Control Scale (*IE*)
6. Levinson (8)
 - a. Internationalism Scale (*IN*)
7. McCord and McCord (12)
 - a. Integratist Conscience Scale (*IC*)
8. Gladstone Interpersonal Scales (5)
 - a. Belligerence in General (*G1*)

² In subsequent discussion and tables, the letter or number tags in parentheses are used when referring to the original test scales.

- b. Belligerence under Threat (G2)
- c. Pacification in General (G3)
- d. Pacification under Threat (G4)
- e. Tendency to Feel Threatened (G5)
- f. Self-assertiveness (G6)
- g. Competitiveness (G7)
- 9. Gladstone International Scales (5)
 - a. Belligerence in General (G8)
 - b. Belligerence under Threat (G9)
 - c. Pacification in General (G10)
 - d. Pacification under Threat (G11)
 - e. Tendency to Feel Threatened (G12)
- 10. Putney and Middleton (13)
 - a. General Items (P1)
 - b. Provocation Level for Nuclear Attack (P2)
 - c. Nuclear Fatalities Acceptable (P3)

2. *Development of the New Scales from the Original Battery*

The construction of the six factor scales from the original test battery evolved in a series of steps from selection and analysis of the original tests to assignment of items to the factor scales.

a. *Factor analysis of original battery.* To determine the extent to which these scales were related to one another and to determine whether a smaller number of factors could account for the score variance of these scales, the 24 scale scores were intercorrelated, factored using the principle axes solution, and rotated using a normal varimax program. Table 1 reports the six orthogonal factors (A-F) that emerged for a sample of 247 freshman and sophomore college males. Based on the pattern of factor loadings, psychologically meaningful interpretations were formulated.

b. *Factor scores as factor criterion measures.* To sharpen the interpretations that could be obtained from the factor analysis, it was decided to examine the test items themselves. Factor scores were estimated for all subjects.³ These six estimates were then employed as criterion measures for each of the six factors, and validity coefficients were obtained for all test items. Sets of items with high validities on only one of the six factor-score criteria were identified.

³ Before the PAS scales were available, these factor scores were employed in an experimental study of bargaining behavior. A description of these factors and their relationship to a variety of bargaining indices is reported in a separate monograph by Shure, Meeker, Moore, and Kelley (16).

TABLE 2
FACTOR LOADING FOR ROTATED FACTOR MATRIX OF 102 SCALE ITEMS

Current item tag	Factor						Original scale
	I	II	III	IV	V	VI	
Scale I							
A02	47	.....	.....	.....	.....	.....	G9
10	51	.....	.....	.....	.....	.....	G8
18	39	.....	.....	.....	.....	.....	G8
26	48	.....	.....	.....	.....	.....	G8
34	55	.....	.....	.....	.....	.....	P1
42	43	.....	.....	.....	.....	.....	G9
50	-29	.....	.....	.....	.....	.....	G9
58	43	.....	.....	.....	.....	.....	G12
66	48 42	.....	.....	.....	.....	.....	G8
B04	33	.....	.....	.....	.....	.....	G9
12	57	.....	.....	.....	.....	.....	G12
20	38	.....	.....	.....	.....	.....	G9
28	.....	.....	.....	.....	.....	.....	G8
36	41	.....	.....	.....	.....	.....	G9
44	-34	.....	.....	.....	.....	.....	G1
C70	29	.....	.....	.....	.....	.....	P3
Scale II							
A04	..... -63	.....	.....	.....	.....	.....	G4
12	..... -50	.....	.....	.....	.....	.....	G4
20	..... 37	.....	.....	.....	.....	.....	G4
28	..... -56	.....	.....	.....	.....	.....	G4
36	..... -44	.....	.....	.....	.....	.....	G3
44	..... -47	.....	.....	.....	.....	.....	G3
52	..... 53	.....	.....	.....	.....	.....	G3
60	..... -58	.....	.....	..... -25	.....	.....	G4
68	..... -46	.....	.....	.....	.....	.....	G2
B06	..... -40	.....	.....	.....	.....	.....	G4
14	..... 28	.....	.....	.....	.....	.....	G4
22	..... 33	.....	.....	.....	..... 28	.....	G4
30	..... -38	.....	.....	.....	.....	.....	G10
38	..... -29	.....	.....	.....	.....	.....	G3
46	..... 37	.....	.....	.....	.....	.....	G2
50	..... -44	.....	.....	.....	.....	.....	G3
54	..... -44	.....	.....	.....	.....	.....	G10
58	..... -50	.....	.....	.....	.....	.....	G5
Scale III							
A06	.....	.....	51	.....	.....	.....	IN
14	.....	.....	41	.....	.....	.....	IN
22	.....	.....	43	.....	.....	.....	IN
30	.....	.....	53	.....	.....	.....	IN
38	.....	.....	46	.....	.....	.....	P1
46	.....	.....	58	.....	.....	.....	F
54	.....	.....	50	.....	.....	.....	F
62	-27	.....	49	.....	.....	.....	IN
70	.....	25	45	.....	.....	25	G11

TABLE 2 (continued)

Current item tag	Factor						Original scale
	I	II	III	IV	V	VI	
B08	0000	26	35	0000	0000	0000	G11
16	0000	0000	43	0000	0000	0000	G10
24	0000	0000	33	0000	0000	0000	IN
32	0000	0000	38	0000	0000	0000	G10
40	0000	0000	39	0000	0000	0000	F
48	0000	0000	42	0000	0000	0000	F
52	0000	0000	41	0000	0000	0000	F
56	0000	0000	44	0000	0000	0000	F
60	0000	0000	37	0000	0000	0000	G11
62	0000	0000	42	0000	0000	0000	F
64	0000	0000	55	0000	0000	0000	F
66	0000	0000	48	0000	0000	0000	F
68	0000	0000	41	0000	0000	0000	F
Scale IV							
C02	0000	0000	0000	-47	0000	0000	RM
04	0000	0000	0000	-48	0000	-27	RM
06	0000	0000	0000	-45	0000	0000	RP
10	0000	0000	0000	-47	0000	0000	RP
12	0000	0000	0000	-38	25	0000	RM
14	0000	0000	0000	-57	0000	0000	RP
18	0000	0000	0000	-37	0000	0000	A
20	0000	0000	0000	-54	0000	0000	RP
22	0000	0000	0000	-29	0000	0000	RM
26	0000	0000	0000	-38	0000	0000	RP
28	0000	0000	0000	-60	0000	0000	RP
30	0000	0000	0000	-51	0000	0000	RP
34	0000	0000	0000	-60	0000	0000	RP
36	0000	0000	0000	-44	0000	0000	RP
38	0000	0000	0000	-35	0000	0000	RM
42	0000	0000	0000	-28	0000	0000	A
44	0000	0000	0000	-39	0000	0000	A
46	0000	0000	0000	-44	0000	0000	RM
48	0000	0000	0000	-40	30	0000	RP
Scale V							
C50	0000	0000	0000	0000	47	0000	IE
52	0000	0000	0000	0000	47	0000	IE
54	0000	0000	0000	0000	67	0000	IE
56	0000	0000	0000	0000	58	0000	IE
58	0000	0000	0000	0000	63	0000	IE
60	0000	0000	0000	0000	54	0000	IE
62	0000	0000	0000	0000	37	-25	IE
64	0000	0000	0000	0000	43	0000	IE
66	0000	0000	0000	0000	45	-26	IE
68	0000	0000	0000	0000	62	0000	IE
Scale VI							
A08	0000	0000	0000	0000	0000	54	G5
16	0000	0000	0000	0000	0000	43	G5
24	0000	0000	0000	0000	0000	43	G5

TABLE 2 (continued)

Current item tag	Factor						Original scale
	I	II	III	IV	V	VI	
32	.000	.000	.000	.000	.000	41	G12
40	.000	.000	.000	.000	.000	40	G5
48	.000	.000	.000	.000	.000	44	G5
56	.000	.000	.000	.000	.000	44	G5
64	.000	.000	25	.000	.000	34	G4
B10	.000	.000	.000	.000	.000	35	G7
18	.000	.000	.000	.000	.000	35	G6
26	.000	.000	.000	.000	.000	32	G7
34	.000	.000	.000	.000	.000	34	G3
42	.000	.000	.000	.000	.000	35	G8
C16	.000	.000	.000	-27	-38		S
24	.000	.000	.000	.000	-33		S
32	.000	.000	.000	.000	-35		S
40	.000	.000	.000	.000	-40		S

Note: Factor loadings with values $< .25$ are not shown. Decimal points are omitted.

C. PERSONALITY/ATTITUDE SCHEDULE

1. Description of the Scales

The PAS scales are interpreted in terms of the items assigned to each as determined by the three sets of procedures employed, particularly by the factor analysis of the items. Table 2 indicates the original scales from which the items were derived and shows that each factor tends to derive its items from a small subset of the original scales. The scales are tentatively labeled and described as follows:

a. Aggressive militarism (factor I). High scorers emphasize reliance on use of force, threats, power, and armed strength as national policy in dealing with foreign powers; they de-emphasize trust and understanding as a foundation for negotiations. They advocate the use of arms to intervene by force, to threaten to attack, and to counterattack, and are willing to fight physically and suffer fatalities for "what is right." Factor I items derive primarily from Gladstone's International Scales, G8 and G9.

b. Conciliation versus belligerence in interpersonal relations (factor II). High scorers advocate responding to the needy and less fortunate (or even to unfriendly, quarrelsome, provocative, and hostile persons) with understanding, help, and friendliness. They urge admitting their own wrongs, and refuse to use threats or belligerent means or to be motivated by revenge. Instead they advise a diplomatic and constructive response guided by considerations of humanitarianism and cooperation. Factor II items primarily derive from Gladstone's Interpersonal Scales, G2, G3, and G4.

c. Authoritarian nationalism versus equalitarian internationalism (factor III). High scorers exhibit the authoritarian personality and values, ethnocentrism (outsiders seen as inferior, envious, and threatening), nationalism (America idealized, emphasis on national honor and sovereignty), and a policy of military strength that may lead to "fortress America" isolationism or military imperialism. Their ideology reflects autocratic and moralistic orientations to child-rearing, overridealization of parents, who are seen as strong authorities requiring obedience and respect, and an emphasis on work rather than leisure. They exhibit little capacity for, and an avoidance of, self-awareness; they deny aggressiveness to friends, fear expressing weakness, and desire to submit to a powerful authority. (Note the distinction of this factor from factors I, V, and VI, which have been subsumed under factor III in many descriptions of the authoritarian personality.) Factor III items derive primarily from the *F* scale (*F*), Levinson's Internationalism (*IN*), and Gladstone's International Scales, *G10* and *G11*.

d. Risk avoidance (factor IV). High scorers are unadventurous, exhibit a low activity level, and are unwilling to expose themselves to dangers or to hazard risks of either a material or physical character. Factor IV items derive from Guilford's two risk-taking scales (*RM*, *RP*) and Thurstone's Active scale (*A*).

e. External versus internal control (factor V). This scale is essentially a subset of the items from the Liverant Internal/External Control Scale (*IE*). High scorers believe that events are controlled by external forces (fate, chance, events). Low scorers believe that they can exercise some control over the events around them.

f. Suspiciousness versus trust (factor VI). High scorers are characterized by paranoid-like traits of selfishness, projection of hostility, excitability, and tenseness. Low scorers are characterized by a trusting, unselfish, calm, and optimistic orientation. Factor VI items derive primarily from Gladstone's Interpersonal Scales, particularly *G5*, and from Thurstone's Stable scale (*S*).

2. Scoring

The 102 items for the six factor scales are combined into the *PAS*⁴ (see Appendix). Each item is keyed on its appropriate scales as indicated in Table 3. Depending on the negative or positive form of the item, the weights for each item are scored negatively or positively. The contribution of an item to the total scale score is the product of the item weight and the respondent's

⁴ The item numbering has been prepared for respondents to record answers on a set of three Port-O-Punch IBM cards.

TABLE 3
SCORING KEYS FOR SIX PAS SCALES

Factor scales					
I	II	III	IV	V	VI
Weight +1	Weight +1	Weight +1	Weight +2	Weight +1	Weight +1
A50	A04	A06	C02	C50	A08
B28	A12	A14	C04	C52	A16
B44	A28	A22	C06	C54	A24
	A36	A30	C10	C56	A32
Weight -1	A44	A38	C12	C60	A40
A02	A60	A46	C14	C68	A48
A10	A68	A54	C18		A56
A18	B06	A62	C20	Weight -1	A64
A26	B30	A70	C22	C58	B10
A34	B38	B08	C26	C62	B18
A42	B50	B16	C28	C64	B26
A58	B54	B24	C30	C66	B34
A66	B58	B32	C34		B42
B04		B40	C36		
B12	Weight -1	B48	C38		Weight -2
B20	A20	B52	C42		C16
B36	A52	B56	C44		C24
C70	B14	B60	C46		C32
	B22	B62	C48		C40
	B46	B64			
		B66			
		B68			

Note: Item B02 is duplicated in another scale. Item C08 is now omitted from scale V. Neither item is scored on any of the scales.

answer. Items of different forms are assigned different absolute weights, so that where different forms of items are used on a particular scale, the relative contribution of any item to the total scale score is approximately equivalent.

D. DESCRIPTIVE STATISTICS FOR THE PAS

1. Scale Means, Standard Deviations, and Intercorrelations

The test battery has been employed in restricted experimental populations. It should be emphasized that no attempt has been made to interpret these scores on an individual basis and that the battery is primarily used for research purposes. Table 4 presents the means and standard deviations for a total of 990 males in five different samples. The population is primarily limited to freshman and sophomore students attending colleges in the Los Angeles area, but also includes a sample of U. S. Navy enlisted men from the San Diego Naval Base. For the first three samples, the scale scores are obtained from items presented in their original tests. The last two samples employ the PAS. This change in mode of item presentation appears to have little overall effect

TABLE 4
MEANS AND STANDARD DEVIATIONS OF PAS SCALES^a FOR FIVE MALE SAMPLES

Sample	N	I	II	III	IV	V	VI
1. Santa Monica City College (Junior College)	347						
<i>M</i>		-31.5	57.1	88.3	75.7	0.80	46.4
<i>σ</i>		13.8	11.9	22.2	14.7	1.89	11.6
2. UCLA (State University)	97						
<i>M</i>		-25.9	56.4	86.9	76.5	0.48	42.0
<i>σ</i>		13.3	11.5	18.8	14.6	1.89	12.0
3. Loyola College (Catholic College)	100						
<i>M</i>		-25.9	56.0	96.1	75.8	0.80	43.5
<i>σ</i>		10.6	11.1	16.4	14.9	1.79	9.7
4. Santa Monica City College (Junior College)	333						
<i>M</i>		-29.5	53.8	81.1	71.7	0.74	40.7
<i>σ</i>		12.7	11.2	19.0	13.6	1.75	11.5
5. U.S. Navy Recruits (San Diego)	113						
<i>M</i>		-31.4	55.3	97.2	76.9	0.96	50.1
<i>σ</i>		13.1	12.7	15.8	14.0	1.85	11.0

^a For the first three samples, scale items are obtained from the original test battery.

on the means and standard deviations. This may be seen most clearly in the two Santa Monica City College samples, where a different form was used for each sample.

Intercorrelations among the scales, based on two samples of college students and employing the earlier and current forms of the test, are presented in Table 5. With the possible exception of factor VI, the interscale correlations are generally small. This is a particularly pertinent finding in view of the apparent interpretive "similarity" of some of the factors.

TABLE 5
CORRELATIONS AMONG PAS SCALES

Scale	I	II	III	IV	V	VI
I		-.13	.25	-.14	.11	.23
II	-.26		-.14	-.10	-.14	-.27
III	.18	-.15		-.13	.12	.34
IV	-.08	.09	-.13		.03	.09
V	-.02	-.22	.01	.05		.28
VI	.09	-.25	.28	.00	.33	

Note: Above diagonal, $N = 333$ (sample 4 in Table 4); below diagonal, $N = 544$ (combined samples 1, 2, and 3 in Table 4).

2. Reliability

Corrected split-half reliability coefficients are calculated for two college samples employing the earlier and current forms of the tests and are presented in Table 6. These split-half reliabilities are all relatively high, except those obtained for scale V. Since this scale is shorter than any of the others, it may be more seriously penalized by this form of reliability estimation. A test-retest evaluation will help to determine whether scale V should be retained or whether its low split-half reliabilities contraindicate its continued use.

TABLE 6
RELIABILITIES OF PAS SCALES (CORRECTED SPLIT-HALF)

Sample	PAS scales					
	I	II	III	IV	V	VI
<i>N</i> = 544 ^a	.77	.80	.87	.81	.56	.72
<i>N</i> = 333 ^b	.79	.71	.85	.78	.48	.66

^a Data from combined samples 1, 2, and 3 in Table 4.

^b Data from sample 4 in Table 4.

3. Internal Consistency of Items

To find out how well the scales maintain their internal consistency in a new sample, item-test correlations were made for a sample of 333 individuals. The correlations of each item with the full scale score are presented in Table 7. The results suggest that with the exception of scale V, item validities tend to be in the acceptable range. The one or two low coefficients obtained for each of the other scales are worth noting as candidates for deletions in subsequent scale revisions.

4. Validity Studies

At present the scales are under evaluation as measuring instruments and their use in experimental studies is still under way. However, there is some preliminary evidence from a few studies that the scale scores are associated meaningfully with a variety of indices of experimental game behavior. In a two-person, nonzero-sum bargaining game, Shure *et al.* (16) related the six factor scores based on the 24 tests to indices of game behavior. They found the factor-score counterparts of factor scales II, III, and IV associated with the joint payoffs. Bargaining pairs composed of high conciliators, equalitarians, or risk-avoiders earned more, respectively, than pairs composed of low conciliators, authoritarians, or risk-seekers. An index, used during game play to assess the Ss' generosity and expectations of reciprocated generosity in a situation where there was no opportunity to check up on their opponents' actual

TABLE 7
ITEM VALIDITY COEFFICIENTS
($N = 333$)

Scale I		Scale II		Scale III		Scale IV		Scale V		Scale VI	
Item	Validity	Item	Validity	Item	Validity	Item	Validity	Item	Validity	Item	Validity
A02	-41	A04	35	A06	45	C02	30	C50	45	A08	44
A10	-56	A12	46	A14	44	C04	45	C52	34	A16	50
A18	-38	A20	-37	A22	47	C06	59	C54	42	A24	52
A26	-48	A28	34	A30	49	C10	43	C56	53	A32	43
A34	-46	A36	45	A38	51	C12	45	C58	-48	A40	41
A42	-56	A44	43	A46	47	C14	53	C60	37	A48	39
A50	36	A52	-43	A54	48	C18	32	C62	-47	A56	30
A58	-52	A60	39	A62	45	C20	50	C64	-22	A64	36
A66	-50	A68	48	A70	56	C22	38	C66	-40	B10	31
B04	-40	B06	47	B08	28	C26	33	C68	26	B18	37
B12	-37	B14	-34	B16	46	C28	52			B26	41
B20	-51	B22	-42	B24	35	C30	54			B34	36
B28	31	B30	35	B32	45	C34	48			B42	31
B36	-46	B38	32	B40	33	C36	33			C16	-36
B44	36	B46	-39	B48	36	C38	16			C24	-38
C70	-21	B50	41	B52	49	C42	27			C32	-31
		B54	39	B56	44	C44	32			C40	-37
		B58	33	B60	53	C46	41				
				B62	36	C48	42				
				B64	65						
				B66	48						
				B68	43						

Note: A negative coefficient indicates the item is reversed in direction from the scale. All such items are keyed with a negative weight.

behavior, was related to factor scores on the suspiciousness dimension. Suspicious Ss tended to be less generous; those who were trusting were more generous.

Crow and Noel (3) report on the use of the PAS in selecting and predicting the behavior of Navy recruits in an international simulation game. They found that individual characteristics significantly affected decision outcome in these experiments. Individuals high in aggressive militarism (factor I) prefer high risk alternatives; those high in authoritarian nationalism (factor III) prefer higher levels of military response than those low in these respects. The differences between low and high scorers on factors I and III were statistically significant in both these respects.

E. SUMMARY

This paper describes the steps used in developing a set of scales to evaluate the effects of individual differences on bargaining behavior. It presents a description of the six scales in the schedule, together with descriptive statistical data and norms for the scales, and gives procedures for administering and scoring the scales. A copy of the currently used form of the schedule is included in the Appendix.

APPENDIX

A PERSONALITY/ATTITUDE SCHEDULE

The items below are a study of what people think about a number of social questions. The best answer to each statement is your personal opinion. Many different points of view are covered; you may find yourself agreeing strongly with some of the statements, disagreeing just as strongly with others, and perhaps uncertain about others. Whether you agree or disagree with any statement, you can be sure that many other people feel the same way you do.

For each statement circle with your pencil the number which best fits your reaction according to how much you agree or disagree with it. Please mark every one, using the following scheme:

7: I agree very much

6: I agree pretty much

5: I agree a little

3: I disagree a little

2: I disagree pretty much

1: I disagree very much

If you are really completely neutral about an item, or if you are completely uncertain how you feel about an item, or if you don't understand it, mark 4.

A-02 To deal successfully with an unfriendly foreign power does not require greater armed strength.

A-04 When someone has been nasty to you, you should try to understand what's bothering him, so that you can be helpful.

- A-06 If the United Nations doesn't show more signs of getting tough with Russia soon, America must be prepared to carry on the fight by itself.
- A-08 Even people who appear friendly to you may be unreliable because they are mainly concerned with their own interests.
- A-10 The United States is not justified in building up armaments which can only be used for attack.
- A-12 We should always help those who are in need, even if they are very unfriendly to us.
- A-14 While we should give military aid to countries which are prepared to fight our enemies, we ought to cut down on foreign economic help, or else the other countries will just play us for a sucker.
- A-16 Some people just have it in for you.
- A-18 Threats are never a good way to get other countries to do what we want them to.
- A-20 You can't make friends with people who are hostile to you to begin with.
- A-22 If it weren't for Russia and her satellites, the world would be headed toward peace and prosperity by now.
- A-24 There are some people who can't be trusted at all.
- A-26 Armed strength does not assist the process of negotiation.
- A-28 In quarrels with other people we should make a point of admitting it when we're wrong.
- A-30 In these troubled times, if we are to be strong and united against our common enemy, we must have more laws and safeguards against the spreading of dangerous ideas.
- A-32 Even nations that appear friendly to us may be unreliable because they are mainly concerned with their own interests.
- A-34 If disarmament negotiations are not successful, the United States should begin a gradual program of unilateral disarmament—i.e., disarm whether other countries do or not.
- A-36 We should always feel responsible for helping others less fortunate than ourselves.
- A-38 Pacifist demonstrations—picketing missile bases, peace walks, etc.—are harmful to the best interests of the American people.
- A-40 Most people are not always straightforward and honest when their own interests are involved.
- A-42 We should not rely on military strength to preserve our way of life against external threats.
- A-44 There is nothing more satisfying than doing something which pleases another person.
- A-46 Obedience and respect for authority are the most important virtues children should learn.
- A-48 A surprising number of people are cruel and spiteful.
- A-50 If an undemocratic nation threatens to attack us, we should encourage a revolution in that nation.
- A-52 Doing favors for people who aren't in a position to return them is a waste of time.

- A-54 Every person should have complete faith in some supernatural power whose decisions he obeys without question.
- A-56 You are likely to have some personal enemies that you don't even know about.
- A-58 We should build our national policy much more on trust and confidence in the motives of other countries.
- A-60 When you quarrel with someone you should make an especial effort to understand his point of view.
- A-62 We need more leaders like MacArthur, who have the morals and the strength to put our national honor above appeasement.
- A-64 You should not have anything to do with people who are hostile to you.
- A-66 We should not try to keep our military strength as great as possible.
- A-68 When someone has said something to hurt you, it is not good to pay him back, even if the things you say about him are perfectly true.
- A-70 Our government has shown too much patience in negotiating with nations which disagree with us.
- B-02 There are some people who can't be trusted at all.
- B-04 If another country threatens us in some way, we should not reply with counterthreats.
- B-06 Doing something to please a person who doesn't like you can give you a lot of satisfaction.
- B-08 The greater the danger of war, the less use there is in working for world disarmament.
- B-10 Most activities are more fun when you can compare your own abilities with other people's.
- B-12 The United States is too ready to interpret the activities of foreign governments as threatening.
- B-14 It is not worthwhile to make compromises and give up your own preferences in order to make peace with a personal enemy.
- B-16 Our diplomats have been too patient in conducting negotiations with other governments.
- B-18 You shouldn't be modest if it leads people to underestimate your abilities.
- B-20 Weapons which can only be used for attack will not help the United States to defend itself against external threats.
- B-22 When you are engaged in a personal dispute, you shouldn't do favors for people who won't take your side.
- B-24 The first principle of our foreign policy should be to join forces with any country, even if it is not very democratic, just as long as it is strongly anti-Communist.
- B-26 It is extremely upsetting to be more poorly dressed than most of the people you associate with.
- B-28 Our government should support revolutionary movements in undemocratic countries.
- B-30 We should try to get people from other countries to visit us and explain their points of view.
- B-32 We should not trade with nations whose policies we don't approve.
- B-34 You should not have anything to do with people whom you don't approve of.

- B-36 If another country attacks us, we should try to get them to stop without resorting to military defense measures.
- B-38 We should be completely frank in telling other people about our own shortcomings and mistakes.
- B-40 No sane, normal, decent person could ever think of hurting a close friend or relative.
- B-42 United States' propaganda should not hesitate to show the faults of other countries.
- B-44 There are some situations in which a man should fight (physically) for what is right.
- B-46 When people are uncooperative, the most effective way to get them to do what you want is to use threats.
- B-48 Young people sometimes get rebellious ideas, but as they grow up they ought to get over them and settle down.
- B-50 It's a good idea to know the problems and worries of people around you, so that you can be helpful.
- B-52 If people would talk less and work more, everybody would be better off.
- B-54 We should try to show other nations that we do not threaten them in any way.
- B-56 Sex crimes, such as rape and attacks on children, deserve more than mere imprisonment; such criminals ought to be publicly whipped, or worse.
- B-58 In spite of occasional lapses, most people are pretty trustworthy.
- B-60 We should not carry on trade with a country that is hostile to us.
- B-62 Some leisure is necessary but it is good hard work that makes life interesting and worthwhile.
- B-64 What youth needs most is strict discipline, rugged determination, and the will to work and fight for family and country.
- B-66 There is hardly anything lower than a person who does not feel a great love, gratitude, and respect for his parents.
- B-68 Books and movies ought not to deal so much with the unpleasant and seamy side of life. They ought to concentrate on themes that are entertaining and uplifting.

The next series of questions are about your likes and dislikes, preferences and habits in everyday life. There are no right or wrong answers to these questions; one answer can be just as good as some other answer.

INSTRUCTIONS: For each question, circle with your pencil either number 1, 2, or 3 for the answer that fits you best.

If your answer is Yes, circle number 1.

If you cannot decide, circle number 2.

If your answer is No, circle number 3.

- C-02 When you have the money do you like to invest it in business ventures?
- C-04 Do you like to wager with very small stakes just for the kick you get out of gambling?
- C-06 Would you like to do stunt flying in an aerial circus?
- C-08 Can you work under distraction?

- C-10 Would you like to dive from a high spring-board?
- C-12 Do you like to play games when money is at stake?
- C-14 Would you like to ride with dare-devil drivers?
- C-16 Do you often alternate between happiness and sadness?
- C-18 Do you drive a car rather fast?
- C-20 Would you like to drive a "hot-rod" in a race?
- C-22 Do you like to bet money on athletic events?
- C-24 Do you often feel impatient?
- C-26 Do you like to invest money in a promising invention?
- C-28 Would you like to be a test pilot?
- C-30 Would you like to run river rapids in a motor boat?
- C-32 When you are emotionally upset, do you tend to lose your appetite?
- C-34 Would you like to work as a flying trapeze acrobat in a circus?
- C-36 Would you like to ride out a storm in a small boat?
- C-38 Would you be willing to take a chance by accepting a job you know nothing about?
- C-40 Does it irritate you to be interrupted when you are concentrating?
- C-42 Do you usually work fast?
- C-44 Do you like to drive a car rather fast when there is no speed limit?
- C-46 Would you like to speculate in the stock market occasionally?
- C-48 Would you like to go on the first rocket-ship expedition to the moon?

This series of items attempts to find out the way in which certain important events in our society affect different people. Each item consists of a pair of statements, one of which has the number 1 in front of it and the other the number 2. In the case of each item, read both statements carefully and select the one statement of each pair (and only one) which you more strongly believe to be the case as far as you are concerned. Indicate your choice by placing a circle with your pencil on the number of the statement which you believe to be more true. There are no right or wrong answers to this questionnaire. For every item there are large numbers of people who pick 1 and large numbers who pick 2.

I more strongly believe that

- C-50
 1. the average citizen can have an influence in government decisions.
 2. this world is run by a few people in power, and there is not much the little guy can do about it.
- C-52
 1. if I make an effort, I can get people I like to become my friends.
 2. no matter how hard you try, some people just don't like you.
- C-54
 1. people's misfortunes usually result from the mistakes they make.
 2. sometimes I feel that I don't have enough control over what happens to me.
- C-56
 1. in the long run, people get the respect they deserve in this world.
 2. unfortunately, an individual's worth often passes unrecognized no matter how hard he tries.
- C-58
 1. some guys are born to take orders and others are born to give them.
 2. in the long run the guy with more ability ends up giving the orders.
- C-60
 1. I could usually tell whether I had done well or poorly on a test in school

as soon as I had finished taking the test.

2. I often felt I couldn't predict which grade I would get on a test.
- C-62 1. if one gets the right teacher he can do well in school, otherwise he has trouble.
2. the grades a person gets in school are up to him.
- C-64 1. I often can't understand how it is possible to get people to do what I want them to.
2. getting people to do what you want takes hard work and patience.
- C-66 1. getting a good job depends partly on being in the right place at the right time.
2. if you've got ability, you can always get a job.
- C-68 1. people are lonely because they don't know how to be friendly.
2. making friends is largely a matter of being lucky enough to meet the right people.

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PERSONNEL ATTITUDES AND PATIENTS' EMOTIONAL RESPONSE TO HOSPITALIZATION FOR PHYSICAL ILLNESS*¹

VA Hospital, Downey, Illinois; and VA Hospital, Washington, D.C.

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A. INTRODUCTION

Interest in the relationship between staff attitudes and patients' responses has been strikingly evident recently. Canter (2), Carstairs, Gilbert, Heron, Levinson, and Pine (3), Cohen and Struening (4), and Ellsworth (6), among others, have studied staff attitudes as related to mental patients. Although little work has been done relating staff attitudes to patients' responses in the general medical and surgical hospital setting, staff attitudes in this setting could reasonably be expected to be related to patients' reactions, particularly for patients with a physical disorder requiring relatively long hospitalization.

Hospitalization for prolonged physical illness may be viewed as an unusual stress situation that usually requires the individual to develop new social roles which may be foreign to his typical behavior, in addition to coping with pain and discomfort. Since a large segment of any person's coping behavior is related to his interpersonal milieu, particularly those people who control his rewards and punishments, it is reasonable to expect that the attitudes of the hospital personnel would assume a high position in the hierarchy of stimulus-importance for the patient.

Barrell, DeWolfe, and Cummings (1) presented a measure of staff attitudes toward the care of physically ill patients, called the Philosophy of Treatment Form (POT). Another important set of factors related to emotional response

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¹ The data for the study were collected from Veterans Administration Hospitals at Buffalo, New York; East Orange, New Jersey; Fayetteville, Arkansas; Hines, Illinois; Martinsburg, West Virginia; Oakland, California; Sunmount, New York; and Wilkes-Barre, Pennsylvania.

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to hospitalization concerns the intraindividual characteristics of the patients. DeWolfe, Barrell, and Cummings (5) described a measure of the patient's subjective emotional response to hospitalization, called the Pleasure-Displeasure Quotient (PDQ). The present hypothesis-generating study investigated the relationship between staff attitudes and patients' emotional response to hospitalization by correlating the attitudes of professional personnel with the response to hospitalization of the patients under their care.

B. METHOD

1. Subjects

The personnel and patients from 19 wards of eight Veterans Administration general medical and surgical (GM&S) hospitals across the country participated in the study (see footnote 1 for the locations of the hospitals). The Philosophy of Treatment Questionnaire (POT) was administered to 281 professional personnel of the 19 wards. There were 18 physicians, 96 nurses, 18 practical nurses, 120 aides, and 29 rehabilitation personnel in the staff sample. A measure of emotional response to hospitalization was obtained from 443 male patients under the care of these personnel.

2. Measuring Instruments²

The seven attitude areas from the POT obtained for each staff participant included (a) favors authoritarian interpretation of rules, (b) believes that patients should be informed about their condition, (c) accepts the idea that staff behavior affects patients, (d) is aware of patients' needs, (e) perceives the need for congeniality among the staff, (f) views patients unfavorably, and (g) thinks the staff should be self-critical about their performance. Ward means were computed for each attitude area and separate ward means were calculated for physicians, nurses, aides, and rehabilitation personnel (including psychologists, social workers, physical and occupational therapists, and others).

The measure of the patients' emotional response to hospitalization was the Pleasure-Displeasure Quotient (PDQ). It is a composite score based on the patient's response to three tests: (a) *The Patient's Opinion Form* which specifically asks the patient to express his feelings about things he is experi-

² The development and validation of the measure of staff attitudes (Philosophy of Treatment Form) and the specific items in it were presented in Barrell, DeWolfe, and Cummings (1). A study by DeWolfe, Barrell, and Cummings (5) explains the measure of patients' emotional response to hospitalization (Pleasure-Displeasure Quotient) in detail, presents additional information on the patient sample, and indicates other psychological tests that were administered to the patients at the same time as those used in the present study.

encing due to his hospitalization (e.g., the treatment he is receiving, hospital rules, nursing care, etc.); (b) *The Hospital Adjustment Inventory* which requires the patient to answer "yes" or "no" to questions about worries he might have (e.g., "Do you worry about finding enough things to do on your ward?" or "Do you worry about being able to keep up the payments on your home, furniture, or car?"); and (c) *The Hospital Situation Study* which is a multiple choice adaptation of the Rosenzweig Picture Frustration Test using pictures of hospital situations. The Pleasure-Displeasure Quotient (PDQ) is a ratio composed of the total number of responses in all three tests denoting pleasure divided by the sum of all the pleasure and displeasure responses. A ward mean PDQ was obtained for all participating patients on each ward.

3. Procedure

The staff and patient measures from each ward were obtained as close together as possible, usually approximately one week apart. A maximum effort was made by the Principal Investigators to include all staff members and all patients who were physically capable and sufficiently cooperative to participate. The mean percentage of patient participation for the 18 of the 19 wards for which data was available was 77 per cent. Poor medical condition accounted for the majority of the patients who did not participate with only 5 per cent of the total sample omitted because the patient refused to participate. Although less complete data on staff participation were available, 85 per cent staff participation would be a conservative estimate.

The staffs were seen in groups, and they were assured that no one from their hospital would see their responses. Each person was given a questionnaire and asked to fill it out and return it sealed in an envelope addressed to the central data collection center. The patients from the same wards were tested in two sessions of approximately one hour each, with the testing done in groups whenever possible.

C. RESULTS AND DISCUSSION

The relationships between personnel attitudes and patients' responses were explored by intercorrelating the *ward means* of the staff attitude measures mentioned above with the *ward means* of the emotional response of the patients from the same wards.

When the unweighted mean of the attitude scores of all staff members on the wards were correlated with the mean emotional response to hospitalization of the patients under their care, one of seven staff attitude areas was significantly related to the patients' response. Staff attitude scores on Area E

(perceives the need for congeniality among the staff) were significantly negatively ($r = -.51, p < .05$) related to the patients' emotional response to hospitalization (PDQ).

Since the unweighted mean of all staff members on a ward favors the professional group with the greatest number, it seemed likely that the results based on the means of all the staff members reflected primarily the attitudes of the aides. In most wards there were more aides than personnel in all the other professions combined. Further, the impact of a staff member's attitude on a patient might well be a function of his profession and there was no *a priori* system for weighting the means of the various professions to compensate for the differing impacts. For these reasons, the means of the attitudes of physicians, nurses, aides, and rehabilitation personnel were separately correlated with patients' reactions. A total of 42 tests was done comparing the differences between professions in the strength of the relationships of staff attitudes to patients' reactions. The six differences significant at the .05 level or better, when 2.1 would have been expected by chance, provided empirical support for the separate analyses by profession.

The correlations of the attitudes of the individual professions with the patients' emotional response to hospitalization are presented in Table 1. In these analyses, six of 28 correlations were significant at the .05 level or better, whereas only 1.4 significant at the .05 level would have been anticipated by chance.

The statistically significant findings in the present study were often counter to the commonly held expectations about what staff attitudes should lead to a more positive response to hospitalization by patients. The significant relationships were all negative and with the exception of Areas F (unfavorable attitudes toward patients) and A (authoritarian interpretation of rules), positive correlations would probably have been anticipated. Since some of the results were unexpected and no compelling or clear-cut theoretical explanation was available, other alternatives were explored.

Distortions in the responses of the subjects, particularly the social desirability and acquiescence response tendencies, were evaluated. Social desirability bias in the staff responses seemed unlikely, as the means for all staff professions were on the unfavorable side for Area F and on the authoritarian side for Area A. In both of these areas, social desirability among hospital personnel would dictate the opposite of these results. With regard to acquiescence bias, Areas D, E, and F would give an equally maximum opportunity for this bias to occur and although Areas D and E give the significant results opposite

TABLE 1
CORRELATIONS OF STAFF ATTITUDES WITH THE EMOTIONAL RESPONSE TO
HOSPITALIZATION (PDQ) OF THEIR PATIENTS
(All correlations are based on comparisons of ward means)

Attitudes (POT area scores)	Professions ^a	Correlations with PDQ
A. Favors authoritarian approach to rules	Physician	-.43
	Nurse	.30
	Aide	-.09
	Rehabilitator	-.31
B. Thinks patients should be informed	Physician	-.49*
	Nurse	-.01
	Aide	-.32
	Rehabilitator	-.06
C. Accepts staff actions affect patients	Physician	-.10
	Nurse	.14
	Aide	-.22
	Rehabilitator	-.11
D. Is aware of patients' needs	Physician	-.16
	Nurse	.22
	Aide	-.39
	Rehabilitator	-.72**
E. Believes staff should be congenial	Physician	-.15
	Nurse	.14
	Aide	-.69**
	Rehabilitator	-.67*
F. Views patients unfavorably	Physician	-.51*
	Nurse	.24
	Aide	-.20
	Rehabilitator	-.65*
G. Thinks staff should be self- critical	Physician	.11
	Nurse	-.08
	Aide	.16
	Rehabilitator	.14

* $p < .05$.

** $p < .01$.

^a The N of wards for the professions varies as follows: Physicians = 18, Nurses and Aides = 19, and Rehabilitators = 13.

to those expected, Area F shows the significant results in the anticipated direction.

The fact that some of the significant relationships are in the expected direction and others are in the unexpected direction makes the general response bias interpretation unlikely. Further, a generalized response bias effect seems rather improbable, since there are two independent sources of response entering into every correlation (i.e., *staff* attitude measures and measures of *patients'*

response to hospitalization). In order to find a spuriously significant negative correlation when a positive relationship actually exists, the distortion resulting from response bias in the staff measures would, in all likelihood, have to be proportional to a response bias in the opposite direction shown by the patients, which seems most unlikely.

Since the significant correlations in the current study were all negative r 's, there was some possibility that all these r 's were produced by a pervasive, oppositional, or unhappy attitude on the part of the patients. This sort of unhappy or hostile attitude was contraindicated by the fact that all of the ward mean PDQs and most of the PDQs of the individual patients were on the pleasure end of the continuum.

In light of the above analyses, the significant negative correlations found when positive relationships would probably have been expected did not seem likely to be the result of an artifact. Although the evidence from the present study is far from conclusive, the results appeared to indicate that many of our cherished beliefs about what improves patients' satisfaction with hospitalization apply primarily to patients with acute medical disorders or short hospitalizations. Based on the results of the current study, it seems possible that patients with a chronic medical disorder which requires a relatively long hospitalization prefer friendly (favorable attitudes of staff toward patients, Area F) but impersonal care (little information about their condition, Area B, and less concern about their individual needs, Area D).

The unexpected negative r of the patients' PDQ with staff attitude Area E (sees a need for the staff to be congenial) was most likely due to a strong relationship between this attitude and an orientation toward close personal relationships with patients. An earlier study on the POT questionnaire (1) indicated a strongly cohesive cluster of Areas C, D, and E (the "other directedness" cluster) which was found in three independent samples. It would follow that an aide or rehabilitator with strong concern about staff congeniality would also tend to be oriented toward the close personal contacts with patients which appear to decrease patients' satisfaction with hospitalization.

The conclusion that chronic medical patients prefer friendly but impersonal care was indirectly supported by the results of a previous study (5), which explored patient variables in the response to hospitalization of these same patients on the basis of individual scores rather than a comparison by ward means. This study showed that the patients who expressed the most satisfaction with hospitalization (a) were older, (b) were lower in drive (i.e., had lower

trait anxiety and rated themselves low in recent strain), (c) expressed little desire to be informed about their medical condition, (d) were more accepting of authoritarian interpretation of the rules by the staff, and (e) were expected to show less medical progress in the next year. (Age and anxiety were held constant whenever they were significantly correlated with both variables being correlated.) Thus, little desire for information about their medical condition and chronicity combined with long hospitalization were significantly related to higher satisfaction with hospitalization.

Additional research, particularly with other chronic medical populations including females, will be needed to evaluate further the conclusion that patients hospitalized for chronic medical disorders are most satisfied with hospitalization when they are given friendly but impersonal care, as the results of the current study would seem to indicate.

D. SUMMARY

The results of the present study supported the hypothesis that the attitudes endorsed by the staff are related to the emotional response to hospitalization of physically ill patients. Significant differences between the correlations of the staff attitudes with patients' reactions within different professions indicated that the relationships were often dependent on the profession of the holder of the attitude. Most of the significant findings were results that were the opposite of what would most probably have been anticipated. Since explanations based on social desirability and acquiescence biases appeared unlikely, the results were tentatively interpreted as indicating that patients with chronic medical disorders requiring prolonged hospitalization prefer a friendly but impersonal attitude on the part of the staff caring for them. Additional research will be needed to evaluate further and clarify the current results and tentative conclusions.

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THE "AESTHETIC FEELING" AND ARISTOTLE'S CATHARSIS THEORY*¹

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Aristotle's *Poetics* has survived only fragmentarily; source research and many efforts of philology have proven fruitless; to this day Aristotle's *catharsis* theory remains a mere outline.

With the many currents and cross-currents of philosophical thought and the profusion of aesthetical interests, there remains a curious gap in our knowledge of what the Stagirite meant by *catharsis*. In the present paper the writer will attempt to ask this question properly and point to several answers suggested from the philosophical and psychological points of view.

The influence of Aristotle's *catharsis* theory was enormous; it influenced scholars of all ages. While it has been examined from a moral, psychological, in fact, even from medical viewpoint, its greatest influence has been upon aesthetics. Every student of aesthetics assumes a position relative to it in one way or another. In spite of its fragmentary form, Aristotle's *catharsis* theory is clear in its essentials. It is possible to argue about the meaning of its words or concepts, but in its entirety it gives a plausible picture of the aesthetic experience.

Tragedy then, is an imitation of an action that is serious, complete, and of certain magnitude, in language embellished with each kind of artistic ornament, the several kinds being found in separate parts of the play, in the form of action, not of narrative; through *pity* and *fear* effecting the proper *catharsis* of these emotions (1, pp. 22-23).

This is how much of his *catharsis* theory Aristotle's *Poetics* has preserved for us. Besides the *Poetics*, he talks about *catharsis* in his *Politics* too, where he discusses the purgatory effect of music (2, pp. 669-670). In the *Rhetorics*, he dwells on the nature of *fear* and *pity* at a somewhat greater length (3, Book II, pp. 4-5; 7-8). He there amplifies his meaning to the effect that the fear relates to *ourselves* and *pity* toward our *fellow humans*. Everything is

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fearful which—if it happens to others—arouses pity; and conversely, everything gives rise to our pity which—if it happens to us—is fearful. Aristotle sharply focuses on the difference between fear and pity when he says that fear is not only a painful feeling which we experience upon observation or imagination of adversity (like pity) but also *disturbance* of the soul (*tareché*). An addition to this is the remark that we feel pity toward persons who are at a certain distance from us. Pity can neither apply to ourselves nor to those in close relationship to us, for the suffering of those affects us as if we ourselves were to suffer.

Our data does not enable us to reconstruct the entire theory. We have, however, enough to establish this much: Aristotle wished to give an answer through his theory to one of the basic and, perhaps, most difficult questions of how and what sort of aesthetic pleasure can be derived from the pains depicted in a tragedy (play). The concepts which he uses for this purpose are *feelings of fear and pity*, and *catharsis* itself. We learn of pity that Aristotle considers it a particular feeling that does *not* refer to us (*extrinsic feeling*), and for this reason it does not disturb our soul, it does not make our soul anxious (in other words, it lacks something, it is an "incomplete feeling"). On the other hand, fear refers to ourselves (that is, it is an *intrinsic feeling*); therefore, it shakes our soul.

On the basis of the available data we cannot establish what Aristotle takes the exact nature of *catharsis* to be, or what the mechanism is by which a feeling of negative impression can change into an aesthetic pleasure of positive appearance. There is ample opportunity here for different interpretations, and the aestheticians have taken advantage of this opportunity. There is no count of their theories on this subject. In an effort to give a short description of these, the writer will mention only those theories upon which she wishes to base some of her discussion. The authors of the theories mentioned do not all make reference to Aristotle, but their connection to him is evident because the problem itself was first mentioned and given permanent prominence by the Stagirite.

The most widely held theory is the *compensational theory*. Its advocates have chosen the simplest solution. Aristotle in his famous definition talks of "artificially flavoured language" in addition to the somewhat painful and sad feelings of pity and fear. The perception of beauty evidently causes pleasure. What is easier than mixing the pain- and pleasure-producing feelings and saying that in a work of art there are feelings of positive and negative shade as well, but these are always combined in such a way that those with a pleasurable aspect predominate? It is usually added that the pleasure feelings con-

nected with the "formal movement" of the work are the ones which *compensate* for the somewhat painful "context."

However, the compensational theory is certainly a crude form and leads to impossible results. According to this theory, the artist—not unlike the druggist—is supposed to weigh the feelings with meticulous care, lest the scale tip to the side of pains. Whenever the events approach a painful turn, he is to increase the dose of the beauties of the form. Or, perhaps, is he somehow to warn the reader instead that he is about to stress a dreadful part of the tragedy and that his attention should therefore be focused not on the events, but on the beauties of the language or perhaps on the scenery? No, the relative dosage of pleasure and pain are not dependent upon each other. Besides, this theory does not correspond to the thought of Aristotle.

Another group of aestheticians consider the aesthetic feeling a very peculiar kind of illusion—or fantasy—feeling.² According to their theories the aesthetic feelings are different in nature from the emotions of everyday life. They are connected to appearances and fantasies, and their relation to our everyday feelings is much like that of illusion and fantasy to the actual sight or conception of a real object. These theories take into account Aristotle's recognition that we do not personally suffer from the pain expressed in the tragedy, but they overlook some psychological facts. A fundamental characteristic of feelings is that they are attached to propositions as well as to perceptual knowledge (6, p. 229). An injury known through imagination can infuriate us just like one that has actually taken place. If art were no more than "appearance" or "illusion," this effect would be inexplicable.

The *essentialists* claim that the idea or essence of art is where the beauty lies. They advance the idea that art can turn ugly into beautiful, and painful into pleasurable, because the artist is able to place before us the essence of what is represented by omitting the incidentals. This school is quite compatible with the "catharsis" theory. Unfortunately, most representatives of this line of thought limit themselves with (the ever so important!) metaphysical questions and do not wish to give an answer to the urgent psychological questions. Certain scholars of aesthetics, whose basic idea makes them similar to the group under consideration here, have also attempted to consider the psychological point of view. The special subject of Kant's *Critique of Judgement* is the scientific consideration of the judgments resting on the feelings of pleasure and pain arising from the harmony or want of harmony between the particular experience and the laws of understanding. Baumgarten already talks about the

² Collingwood, Croce, Hartmann, Kirchmann, Lange, Pepper, Witasek, etc.

"analogue of the mind" as the aesthetic judgment which is an ability of the soul responsible for grasping the perfection of the senses (4).

The common fault of most essentialists is a one-sided intellectualism. Of course, their theories help to find similar aspects of thinking and the artistic experience; at the same time, as everything overcompensated, the same theories obscure the examination of aesthetic feelings.

The theory of *empathy* started out with a program that was to promise the solution of all problems of aesthetics. The definition was coined from the Greek (tread-into, walk-into) and in literal English translation is "in-feeling" or "feeling-into" after the German "Einfühlung." Empathy is an endowment of the external thing with own feelings, or regarding the object of perception as possessing those qualities of feeling which it arouses in us. The roots of the empathy-theory go back to Herder and its traces can be found in the writings of Dilthey, Jean-Paul, Lotze, and Fr. T. Vischer. Its principal exponent is Theodor Lipps. The fundamental thesis states that the essence of beauty lies in the liveliness of the object (7, Vol. 1, p. 122). Free self-assertion and awareness of our well-being produces delight, and it is coming to life which is made possible by the work of art (7, Vol. 1, p. 111).

Observations of another person's feelings—even if they be anger or pain—may give us enjoyment; we *live* the feeling and this way our substance can gain free expression. Thus the painful feeling depicted in the work may be the source of pleasure for the reader. In other words, one identifies with the other self. This is "complete" empathy. There is another, "incomplete" kind of empathy as well in which one becomes self-conscious during the process, for as soon as one notices his awareness, he no longer makes the attribution of the object perceived (7, Vol. 1, p. 124). Empathy on the basis of imitation is also possible with respect to lifeless objects and their descriptions. In this case our apperceptive activity goes into the object causing it to come to life, and it becomes the source of pleasure because it offers an opportunity for free expression of our self.

The theory of *empathy* attracted a lot of attention, and found many followers. Later, however, increasing weight was accorded to the belief that the empathy-theory was not applicable to the solution of the problem of aesthetics (8, p. 36). Such strict criticism (of course) overshoots the mark.

The *empathy*, first of all, is a rather rare emotional state. If only a small portion of the feelings perceived by us daily were received via total empathy, nearly all our emotional life would consist of nothing but vicariously reliving the feelings of others. The total empathy supposedly gives rise to the same feeling in us that we observe the other person to have. How could we enjoy

the "delight" of freely living through something if it were, in fact, identical to the emotion of another; and how could we then speak of aesthetic pleasure? After all, whoever feels the very passion of Othello blazing in himself will be unlikely to sit in his seat and enjoy Shakespeare's drama. Another question: how can we really live through all the contradictory feelings of the different *personae* of the play? Lastly, we must not forget that the real feeling which complete empathy awakens in us can only generically be the same as that felt by another person. As soon as our wrath is awakened by seeing another person's anger it becomes our own, personal feeling which works with our notions and strivings, and takes place according to our own temper. As one flies into a rage, one increasingly ceases to imitate the anger storming in the soul of another person. Hence, total empathy is really unsuited to perceiving the emotions of another, and hence, cannot be the basis of the aesthetic experience.

On the other hand, a closer examination of the notion of "incomplete" empathy promises much better results. Here we do not have the feelings of another deeply enough to join in his actual sufferings. Rather, we just come to know of it, as it is projected into another, and as we see it *there*. "Incomplete" empathy, then, conforms to what Aristotle said of pity: it is an extrinsic feeling which consequently does not shake our soul. Lipps does not attach significance to "incomplete" empathy. It is instructive to consider three possible reasons for his refusal. One of the reasons was that Lipps considered "total" empathy a "higher-level" emotion, and, as such, more becoming to the aesthetic experience than the "incomplete" empathy—as is shown by the terminology he adopts. Lipps is misled by a misunderstanding, for "incomplete" empathy need not be inferior to "complete" empathy. It may, in fact, presuppose "complete" empathy. The second reason for Lipps' opposition to the "incomplete empathy" is that according to him—and this incidentally agrees with the opinion prevailing today—the reader must completely empathize with the *author's* emotions as embodied in his characters. But if the artist himself only "incompletely" empathizes with the emotions of his characters—in this case—is the reader's attempt to achieve total empathy with the characters frustrated by the author's "inferior" empathy? Objectively, it is evident in any event that the artist cannot actually live through the passions of the characters drawn by him. Just as the reader could not stay and "enjoy himself" if he were actually to live through the jealousy that led Othello to strangle Desdemona, so would Shakespeare have been unable to describe it if he had to live it through too. Someone who is possessed by passions violent enough to make him murder cannot just simply sit at his desk and write a play. The third possible reason that caused Lipps to search for the basis of aesthetic experi-

ence in complete empathy may have been his misconception that the reader fully abandons himself to the work of art, completely forgetting himself. Even if we do not accept the illusion-aesthetic theory of Lange, we must admit that in reality the audience never completely forgets itself, or the fact that it is sitting in a theater. Wagner said in vain that the good luck of *Tristan* was the poor performance, otherwise the listeners would lose their minds. *Tristan* has, in fact, been performed superbly on more than one occasion, yet we never heard of its effect sending anyone into an insane asylum. This did not even happen to Wagner himself While enjoying art, we indeed bury ourselves in the work of art to such an extent that afterward it is sometimes difficult to get back into the course of our everyday lives; nevertheless, this concentration is in no way deeper than that to which the scientist gives himself over in his scientific enquiry. The scientist too is able to separate himself from his environment, just like Socrates who would stand for hours motionless amid the battlefield, buried in deep thought.

Summing up what we have seen of the various theories, it seems fair to say the following: as far as the subject of artistic representation is concerned, the essentialists are undoubtedly right. The artist indeed grasps the essence of reality, and this is what he places before us in his creation. This also corresponds to Aristotle's viewpoint, who equally expects that in the description of the *personae* emphasis be placed on the character, and that the plot be philosophical; in other words, he expects that the plot consists of what may take place according to probability or necessity, as opposed to what may in fact happen with all its possible details. Advocates of the illusion or fantasy-feeling theory are right inasmuch as we do not suffer from pain described in the work of art. We are speaking here of a unique perception through sensation of someone else's feeling—in particular, through sensation of a kind which informs us of the condition and substance of the "foreign" feeling without disturbing the tranquility of our own soul. Aristotle too looks upon pity from a similar light. Perception of another's feeling takes place by imitation. Hence, once again, it is the theory of empathy which offers the correct explanation. This too corresponds to the viewpoint of Aristotle who considered imitation the essence of artistic activity. Perception of the feeling embodied in the artistic creation is by no means (perceptive) empathy, and least of all is it the so-called "complete" empathy. We do not carry our own feelings into the work of art, but we become acquainted with the emotions that it presents to us. The feelings themselves represented in the work of art are not complete, but are abstract feelings. They only show us the essence, and that is why they do not cause suffering. The *catharsis*, then, is the consequence of the emotional ab-

straction which is the process through which the artist and his follower can come to grips with the emotions torturing him, and can purge themselves of these.

The emotional concepts appearing in the work of art come into existence by way of abstraction. When we speak of abstraction we usually think of some higher-order activity of the mind which yields the abstract thoughts. On second thought, however, we realize that we have no right to limit the inner process of abstraction to the sphere of thinking only.

The emotional concept resembles the intellectual concept both in its formation and in its function. Of the latter we know that it needs some kind of carrier or symbol of stabilization, communicability, and understanding. This symbol in our thinking is the word. It is ascent together with the concept. The work plays the same symbol-role in emotional abstraction as the word does in the creation of notion. Emotional abstraction is connected then to the artistic creative work the same way as is the forming of concepts to the creation of words.

It is obvious that concept-creation cannot begin with comparison of images. If we were unable to deduce the essence of a thing from the first image somehow, it would make little difference how many more images of a similar nature appeared before us, since we could not abstract the essential features from these either. These recognitions prompt researchers to attempt to explain the creation of concepts from the point of view of feeling instead of images.

Let us examine now at least in passing the emotions of the artist in his creation, his relation to his work, and the new relationship established between the work of art and the perceiver (spectator, audience, reader, etc.).

Aesthetic emotion is illusional. During the enjoyment of art we come into a unique position which is like floating between two poles, yet our emotional reflection during our aesthetic experience is basically nothing but judgment. The kind and extent of judgment depends on the literary form, or on the form of the particular work at hand.

It is a generally accepted view that the enjoyment of art consists of receptions of the emotions expressed in the work. The reader is not to give himself to his own feelings completely because that should detach him from the work and interfere with his enjoyment of it. This does not mean that the reader does not have feelings of his own. Many times this is precisely what the artist wishes to appeal to. The *Iliad* and *Odyssey* awake magnificent feelings of nobility, courage, and tenderness in the readers, but these feelings burn with a different flame in every person depending on his temper. The work of art wants to call forth associations, but these are fabricated on the basis of individ-

ual experience; therefore, their way cannot be exactly marked out in advance. This, however, is not the purpose of the work of art anyhow, since the individual associations, the "own"-feelings—as long as they do not separate one from the work—just enrich and enhance the enjoyment. We may say in short that the emotions expressed in the work of art exhibit the reader's own personal strivings—even if to a varying extent. The emotions aroused this way are not abstracted any more, but they are actual feelings that "shake the soul." The emotions presented in the work are the livelier the more they are like those which occupy us too. Frequently it is determined by the literary form itself what kind of "own"-feelings the work is to bring into resonance in the listener's soul. The kind of emotion aroused as a real feeling in the reader of a tragedy is fear. Hence fear is the actually experienced own emotion of the reader. It is at this point that his emotional life meets that of the tragic hero. It is through this that the listener realizes that his fate too is under discussion in the work, and that his problems attain solution also. The proportion of "own" and "foreign feeling," fear and pity, is different from work to work, from observer to observer, and from reader to reader. Fear might be strong, but it can also be rather weak. In the case of the latter we only slightly feel the danger threatening us, and the pain we observe concerns us just to make us feel a certain spiritual connection to the tragic hero; we sympathize with him. Taking over an expression from the world of sports, we can say that we cheer for him; we worry about him. The statement of Lipps is valid for this situation: namely, that in tragic fear we are not anxious about our fate, but worry about the hero (7, Vol. 2, p. 527).

In this case of only slight concern to our personal lives, fear is little more than a strained attention. Such strained attention, though, is essential to real art-enjoyment. Therefore we could say with a certain simplification that fear taken in a wide and figurative sense is part of every art enjoyment. It is no other than the typical example of the own feeling present in the enjoyment of art. In a similar broad sense we may consider the notion of pity as the aggregate designation of the emotional concepts turning up during enjoyment of art. While it is not commonly understood that, strictly speaking, pity is a reception with our feelings of someone else's pain, its operation is the same as that of feeling the foreign happiness. What we translate as pity is "partaking." We mourn bitterly for someone; we take part in the sorrow of someone; we are grieved with someone. Of course, we may argue that to take part is possible both in joy and sorrow. We are probably not making a mistake then if we designate the fundamental emotions of art-enjoyment as feeling or partaking and feeling for fear.

It is clear from the above why it does not "hurt" us to perceive the painful feelings depicted in the work, but we find no explanation of *catharsis*. Aristotle says that tragedy arouses pity and fear, and achieves cleansing of such passions. This purgation obviously cannot refer to other than the emotion perceived in pity, and that felt as ours in fear. This may also have been what Aristotle had in mind. This is why he connected fear and pity as those feelings that we can be relieved of through *catharsis*. Another fact pointing this way is that, while discussing musical *catharsis* in the *Politics*, Aristotle talks of "pathetic" persons—that is, of people who show special aptitude for some or other passion—saying that *catharsis* has a beneficial influence upon them.

The mechanism of purgation is this: our emotions vary directly with the striving for satisfaction, and the greater the resistance placed along the road to satisfaction by the outside circumstances, the greater the striving for satisfaction. Emotions stepped up like this can really make a person "pathetic," inclined to outbursts of passion. In the artistic experience the pathetic person does not realize that his fate, too, is under consideration; but, seeing the tragic suffering, he comes to know that the road taken by the tragic hero leads to destruction, so he has to look for his solution elsewhere. The essence of every emotional process is adaption: it is endurance or continuance in consciousness of both the identical and unlike attributes of the outside world and our inner subjective life, but it is also the search for the way in which these two could get along. The meaning of that aspect of emotion that permits it to be awakened by both real impressions and imagined things and situations is that the person is able to test, so to speak, different ways of accomplishing harmony with the world—without being exposed to the real conflicts which may lead to destruction. This also happens when we perceive the tragedy. The "pathetic" reader realizes that the road to satisfaction followed by the hero leads to destruction, but he also senses that there are other possible ways too. This road is usually quite clearly shown by the "reconciliatory" movement of the tragedy. The emotional tension present in the soul of the audience is reduced and resolved through this reckoning: his strivings are directed toward the road shown to be passable. *Catharsis* consists of this resolution of relief. *Catharsis* has an enormous educational, moral, and social significance, as has been emphasized by its moral advocates (Corneille, Lehr, Lessing, Manns, Senngel, Stahr, etc.). This significance is to be found in the facts that the outside circumstances in the way of satisfaction are usually moral or social forces, and the available roads to satisfaction are such that the moral and social forces approve of.

In addition to moral and social considerations, relief through catharsis may be important from the point of view of the healthy mental life of the individ-

ual also. The passions (and these are truly tragic emotions) are usually called the spastic expressions of emotional life. According to Ribot, passions are the same in the world of emotions as *fixa idea* is in intellectual life (9, p. 20). The spasm and the *fixa idea* are pathological phenomena. Even though we cannot call passions outright morbid symptoms, we know very well that in their excited form they move at the limits of pathology, and they cause their subjects more pain than pleasure. This is somehow reflected in our impression of the word *passion* also. Purifications of the passions then, from the point of view of the individual, implies return to a more normal and healthier emotional life: it means recovery. Considering this fact, we also have to agree with the medical interpreters of *catharsis* (Bernays, Doering, Freud, Ueberweg, etc.).

There is also a kind of *catharsis* that primarily takes part not in the reader, but in the soul of the artist. The artist expresses his emotions in his work. These emotions are mirroring the impressions of the outside world, but they may also be such that originate from the subject: namely, from the soul of the artist. These feelings of the artist are often so painful that he is shocked. But he is not affected the same way as the pathetic reader is affected by the passions of the tragic hero. However, moulding the emotions into an artistic form and communicating them cannot take place without abstractions. Hence, even the lyric poet must abstract his own feelings in order to describe them. This abstraction doubles the ego of the artist, as it were, and makes him the observer of his own emotions to some extent. As a result of this process, the artist does not live these emotions any more, only observes them in their abstract form. They do not hurt the artist any more, he does not suffer from them—he is purged. Consequently, creative work itself becomes a possible and new road to satisfaction which we can safely call *catharsis*.

In summary, we may conclude that we find the most important problems of aesthetic feelings in Aristotle's *catharsis* theory. He provided the first and most important starting point to working out the whole psychology of the work of art enjoyment. Naturally, we cannot insist that all we have expounded here can be directly derived from the thought-framework of the Stagirite, but in all that we have expounded "... vivid il maestro di color che sanno . . ."³

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NEWS NOTES

Under this heading appear selected items that are considered to be of special interest to psychologists.

The National Science Foundation invites grant proposals for unusual experimental projects that show promise of producing new knowledge of, or high quality improvements in, precollege science or mathematics education.

The Foundation has a continuing interest in such projects which, though they do not fall within the guidelines of existing NSF programs, merit consideration because they marshal scientific resources for the investigation or testing of significant aspects of precollege science education.

Activities supported under these special projects may be regarded as educational research involving the substance of science as well as teaching. Proposals may integrate elements of course content improvement, student activities, teacher education, or may be outside the bounds of any of these programs. Such projects may be locally useful, provide patterns for wide application, or both; or they may be studies which shed light on current or new practices and show the direction for further support.

Institutions eligible to submit proposals include universities and 4-year colleges, associations of professional scientists, and nonprofit research organizations.

Because of the experimental nature of the special projects, applicants for support are encouraged to submit an informal description of the proposed project to serve as a basis for a preliminary opinion on the possibility of support for the proposed work. A preliminary draft of this kind should discuss the need for the project, state the objectives, outline the contemplated work, and indicate the personnel to be involved, the estimated period of time required, and an approximate budget.

There are no specific budget limitations, but because of the limited funds available projects requesting a high level of support must show unusual promise to the given high priority.

While proposals may be submitted at any time, at least four months must be allowed for evaluation and processing. For administrative convenience the Foundation will follow this schedule insofar as practicable:

Proposals submitted by March 1, 1967, will be acted on by August 1, 1967. Proposals submitted by December 1, 1967, will be acted on by April 1, 1968. Starting dates for a project should take into account this schedule; if

problems are anticipated with such timing, special note should be made of starting dates when transmitting the proposal.

Communications should be addressed to Special Projects in Pre-College Science Education, Division of Pre-College Education in Science, National Science Foundation, Washington, D.C. 20550.

* * *

Scholarships for completion of training in physical and occupational therapy are available from the National Society for Crippled Children and Adults. These scholarships are made possible through a grant from Kappa Delta Phi sorority.

Under this program, scholarships are awarded to seniors in a certificate course in physical or occupational therapy or to those completing their clinical affiliations. The basis of selection is academic excellence, financial need, and ability to utilize training.

The deadline for applications is May 1, 1967. For further information, those interested should write the Scholarship Coordinator, National Society for Crippled Children and Adults, 2023 W. Ogden Avenue, Chicago, Illinois 60612.

* * *

Applications are now available for the Predoctoral Internships and Postdoctoral Fellowships in Clinical Psychology offered at the Pennsylvania branch of The Devereux Schools, a group of residential treatment, remedial education, and rehabilitation centers located in suburban Philadelphia. The program covers a full-time 12-month period of training and experience with mentally retarded and emotionally disturbed children, adolescents, and young adults presenting problems of learning and of personal adjustment. Devereux is approved by the American Psychological Association for doctoral internships in clinical psychology and also in counseling psychology. It is approved as an accredited Counseling Center by the American Board on Counseling Services.

Multidisciplinary training and supervised clinical experience is offered in psychodiagnostics, psycho-educational evaluations and remedial procedures, psychoanalytically-oriented individual and group psychotherapy, and in related research. Experience is also provided in clinical case conferences, in milieu therapy and residential treatment and rehabilitation techniques, and in administrative practices. Additional opportunities for supervised clinical experience are offered in the outpatient program of mental health consultation and psychological services provided by Devereux to the local public schools and

community agencies. Summer assignments to Resident Treatment Camps may also be possible.

Preference will be given to predoctoral applicants currently enrolled in, or graduated from, APA approved clinical psychology programs at accredited universities. Postdoctoral applicants must have adequate clinical preparation for the advanced training experience of the Fellowship, including a prior full-time internship or equivalent experience. Stipends ranging from \$3600 to \$6000 (\$3600 is tax exempt) are available to qualified applicants who are U.S. citizens. Room and board are provided without charge to unmarried trainees and a housing allowance of \$50 per month is granted to candidates who are married. The training program is supported, in part, by a grant from the National Institute of Mental Health, U.S. Public Health Service.

Information and applications are available from Dr. Henry Platt, Director of Training, Devereux Foundation Institute for Research and Training, Devon, Pennsylvania.

* * *

The Association for Advancement of the Behavioral Therapies (group for the clinical application of the principles of Behavioral Modification) announces its formation in New York this past spring. The Association is a multidiscipline interest group to bring together all professionals interested in the issues, problems, and development of the general field of Behavior Modification, with specific emphasis on the clinical applications. Membership is open to responsible professionals who are either practicing behavioral clinicians, engaged in research pertinent to the development and advancement of the behavior therapies, or who are interested in acquiring professional knowledge and competence, with a view to eventual active participation.

Cyril M. Franks, Ph.D., has been elected President; Joseph Wolpe, M.D., has been elected Vice-President; and Dorothy Susskind, Ph.D., has been elected Executive Secretary. The Association will publish a News Letter and sponsor symposia, workshops, seminars, and other educational activities as part of its overall functioning.

General correspondence, inquiries, requests for applications or brochures describing the Association should be sent to Dorothy J. Susskind, Ph.D., Executive Secretary, Association for Advancement of the Behavioral Therapies, 415 East 52nd Street, New York, New York 10022.

* * *

The National Science Foundation today announced 10 grants aimed at enriching the subject matter background of more than 750 college, junior and

community college, and technical institute teachers of science, mathematics, and engineering.

The grants, totaling approximately \$140,000, provide for In-Service Seminars for College Teachers to be held during the summer of 1967 or during the academic year 1967-1968. The projects range from sessions of less than a week and involving up to 150 teachers to regularly scheduled programs during the academic year for smaller classes. The shorter projects will provide intensive study of specific topics, while seminars conducted weekly will cover a broader range of material.

Some of the projects provide study opportunities for teachers from urban schools who will commute to nearby major institutions, while others, conducted on a regional basis, will enable teachers from schools spread over a larger geographical area to study at educational institutions in the same region.

Teachers who wish to participate in the projects should write to the National Science Foundation, 1800 G Street, N.W., Washington, D.C. 20550, for the name of the seminar director in their area.

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The New York Medical College—Center for Chronic Disease at Bird S. Coler Hospital will present a course titled, "The Chronically Ill Patient: Principles and Techniques of Rehabilitation," May 1 through May 5, 1967.

The course is designed to provide a thorough exploration of the major disease categories: neuromuscular and musculoskeletal conditions, degenerative disease, and peripheral vascular disease. Because of the multiplicity of problems arising from these conditions, the faculty as well as the student body will be interdisciplinary.

The program will consist of lectures on clinical conditions and the principles of rehabilitation.

Tuition is \$100.00; scholarships may be available. For further details write to Dr. Milton Holtzman, Course Director, Bird S. Coler Hospital, Welfare Island, New York, New York 10017.

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The Arkansas Rehabilitation Research and Training Center, University of Arkansas, and Arkansas State Rehabilitation Service offers a Symposium on Effective Interpersonal Relationships that Produce Behavior Change, to be held April 19 to 21 at the resort city of Hot Springs, Arkansas. Principal speakers are drawn from the broad range of the applied and basic social sciences.

There will be no registration fee. For information and housing write Dr. A. G. McCormack, Associate Director of Training, Arkansas Rehabilitation

Research and Training Center, Hot Springs Rehabilitation Center, Hot Springs, Arkansas 71901.

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The University of Missouri will offer an eight-week "Summer Institute in Data Processing" for college teachers in the social sciences during the 1967 Summer Session. Dr. Eugene L. Zieha, professor of accountancy, will direct the institute. It will be supported with a grant of \$45,880 from the National Science Foundation. Sessions will be held from June 12 to August 4, 1967.

The major objective of the institute will be to prepare college and junior college teachers who are competent in some branch of the social sciences to teach an introductory course in the use of the computer data processor in their particular field and in related social science areas.

A secondary objective is to provide social science departments in colleges with a staff member able to view the computer data processor in terms of the departmental area. It is expected that the capability of the teacher will be increased and his teaching and research abilities benefited. Further, participants in the courses and their institutions will be provided with data files and materials which they may use for educational purposes.

The institute teachers will be Dr. Zieha and Dr. James Holstein, associate professor of statistics. Dr. Zieha will teach a course in data processing and one in techniques and materials of data processing. Dr. Holstein will teach a course in statistical analysis. Participation in data processing laboratory sessions will also be a part of the institute.

Participants in the data processing institute will include about 20 teachers selected from junior colleges and 10 from senior colleges, Dr. Zieha said. They will be chosen from among applicants in all parts of the country. They will receive weekly stipends of \$75 plus allowances for dependents and travel. Information about applications should be made to Dr. Eugene L. Zieha, 322 B&PA Building, University of Missouri, Columbia 65201.